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THE ECONOMIC AND LAND USE IMPACT OF FEDERAL REGULATIONS TO REVIEW NEW INDIRECT SOURCES OF AIR POLLUTION PRIOR TO CONSTRUCTION

Harbridge House, Incorporated

Prepared for
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October 1974

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The purpose of this study is to determine the potential economic and land use impacts of the Federal indirect source regulations. To achieve this goal, the study objectives were defined as follows:

- To assess the magnitude and incidence of the costs resulting from possible design changes necessitated by review requirements, time delays, and any additional data demand generated by the review process.
- To determine the impact of the indirect source review regulations on the location and design of new developments and to assess the probable impact of location and design decisions by developers on land use development patterns and area patterns of vehicle miles traveled.

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- To identify problem areas in administering the regulations and to suggest guidelines to eliminate or ameliorate these problems. Three different appraoches were used to meet these objectives.

1. Analysis of Sic Development-Specific Case Studies

   Six developments were selected as subjects for the case studies: two regional-size shopping centers, two office parks, and two mixed-use (commercial and residential complexes.)

2. Analysis of ISR Experience in Three Regions

   The review programs in FLorida, Oregon, and Philadelphia were selected for this purpose.

3. Analysis of Development Location and Size

   During the course of the project, information on trends and changes in developers' decisions on the size and location of new development was obtained from a large body of printed materials and from numerous discussions and interviews.

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REPORT ON THE ECONOMIC AND LAND USE IMPACT OF FEDERAL REGULATIONS TO REVIEW NEW INDIRECT SOURCES OF AIR POLLUTION PRIOR TO CONSTRUCTION

Prepared for

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United States Environmental Protection Agency

Contract No. 68-01-1561
Cheryl Wasserman, Project Officer

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October 1974

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PART I

EXECUTIVE SUMMARY

A. Introduction

Pursuant to the indirect source regulations (ISR) promulgated by the U.S. Environmental Protection Agency (EPA), an air quality review must be undertaken prior to the construction of large scale facilities that attract significant amounts of automobile traffic. The purpose of this review is to determine whether a facility and surrounding road network can manage the attracted traffic in a manner that does not lead to violation of the ambient air quality standard for carbon monoxide. In this review, the number of parking spaces at a facility is used as an initial indicator of the quantity of traffic that the facility may attract and, thereby, of the potential for the creation or aggravation of an air quality problem. The principal focus of the review process is on facility design, the characteristics of the transportation system serving the facility, and, to a lesser extent, facility location. Measures that a developer can adopt, if necessary, to prevent the accumulation of excessive carbon monoxide concentrations include facility design changes, improvements in the capacity of the road network serving the facility, transit improvements, carpooling incentives, and reductions in parking supply.

B. Study Goals and Scope

The purpose of this study is to determine the potential economic and land use impacts of the Federal indirect source regulations. To achieve this goal, the study objectives were defined as follows:

- To assess the magnitude and incidence of the costs resulting from possible design changes necessitated by review requirements, time delays, and any additional data demands generated by the review process.

- To determine the impact of the indirect source review regulations on the location and design of new developments and to assess the probable impact of location and design decisions by developers on land use development patterns and area patterns of vehicle miles traveled.
- To identify problem areas in administering the regulations and to suggest guidelines to eliminate or ameliorate these problems.

Three different approaches were used to meet these study objectives:

1. Analysis of Six Development-Specific Case Studies

Six developments were selected as subjects for the case studies: two regional-size shopping centers, two office parks, and two mixed-use (commercial and residential) complexes. Information on the six developments was used in two ways:

(i) To assess the applicability of the EPA Technical Guidelines in reviewing a variety of existing developments and to evaluate whether specific facilities would hinder the attainment or maintenance of national ambient air quality standards for carbon monoxide.

(ii) To determine the economic impact of ISR on the financial costs and feasibility of the specific projects.

The case study findings were most important as input to the economic impact portion of the report.

2. Analysis of ISR Experience in Three Regions

In order to provide a broader approach to evaluating ISR impact than would be possible through an analysis of only six cases, a study was made of the review process in three areas of the country that have already initiated some form of indirect source regulation. The review programs in Florida, Oregon, and Philadelphia were selected for this purpose. The analysis of experiences in the three areas was used primarily to identify potential administrative problems and possible solutions to issues that may arise during ISR implementation.

3. Analysis of Development Location and Size

During the course of the project, information on trends and changes in developers' decisions on the size and location of new development was obtained from a large body of printed materials and from numerous discussions and interviews with Federal and regional EPA officials, state and local air pollution control office representatives, developers and developer organizations, members of the financial community, traffic consultants, and others. This data was used as a measure of potential ISR impact on land use.

C. Economic Impact Analysis

Three types of ISR-related economic impacts were identified. These were broadly categorized as follows:

- Data acquisition and ISR application preparation costs.
- Time-related costs.
- Design change costs. [1]

After performing analyses of the effects of the six case studies on localized carbon monoxide concentrations, costs that could be incurred by the developers as a result of the review were estimated and financial statements prepared to show the impact of the costs on each project's feasibility.

A sensitivity analysis was also performed to determine changes in economic impact under alternative cost assumptions and to provide the basis for further assessment of each of the three cost categories as independent variables. The findings on economic impact are summarized in Exhibits I-1 and I-2.

---

[1] Design changes may be classified as either capacity increasing (primarily highway-related improvements) or volume decreasing (transit, carpooling, etc.). The purpose of design changes is to eliminate the build-up in carbon monoxide concentrations at specific locations.

EXHIBIT I-1

SUMMARY OF SIX CASE STUDY ANALYSES

		TOTAL COSTS			RETURN ON INVESTMENT		
		WITHOUT ISR	WITH ISR No Delay	WITH ISR 90 Day Delay *	WITHOUT ISR	WITH ISR No Delay	WITH ISR 90 Day Delay *
Office Park							
	Project A	$31,425,000	$31,428,215	$31,749,222	19.1%	19.1%	18.6%
	Project E	24,800,000	25,202,080 (H)** 24,977,480 (T)	25,301,501 (H) 25,079,001 (T)	21.0%	20.2% (H) 20.3% (T)	20.0% (H) 20.1% (T)
Shopping Center							
	Project B	37,200,000	38,892,000	39,811,300	14.2%	12.2%	11.3%
	Project F	13,712,000	16,480,750	16,824,121	30.3%	20.2% 24.6% ***	19.2% 23.5% ***
Mixed Use							
	Project C	27,750,000	27,753,000	28,221,757	12.8%	12.8%	12.1%
	Project D	113,982,000	115,613,300	116,464,700	(3.9%)	(4.2%)	(4.4%)

* Inflation rate of 1 percent per month

** H = Highway Design Change
T = Transit Design Change

*** With an 8 percent increase in rents

EXHIBIT I-2

SUMMARY OF ISR RELATE
(DOLLARS)

	Application Related Costs		Design Change Related C			
			Highway			Mass Trans
	Technical Guidelines	Computer Modeling	Case 1	Case 2	Case 3	Case 4
Office Park						
Project A	$3,000	$45,000	0	0	0	0
Project E	-	$ 5,000	$ 396,480	$ 151,200	$ 252,200	$193,480
Shopping Center						
Project B	-	$35,000	$1,653,000	$ 287,840	0	0
Project F	-	$10,000	$2,756,842	$1,964,700	0	0
Mixed Use						
Project C	$3,000	$ 5,000	0	0	0	0
Project D	-	$40,000	$1,587,300	$1, 587,300	$531,000	$413,961

Highway

Case 1. Developer bears full capital investment cost. The public assumes maintenance costs of highway.

Case 2. Developer assumes the capital investment cost of design changes involving local roads. The public assumes the remaining capital investment and all maintenance costs.

Case 3. Developer assumes all capital costs as well as operating and maintenance costs of an interim transit system set up to service the facility between its opening and completion of permanent design changes. The public bears capital and maintenance costs of the permanent changes

Transit*

Case 4. The developer bears full capital and operating and maintenance costs for design changes.

Case 5. The public assumes 80 percent of transit equipment costs. The developer assumes the remaining capital costs and operating and maintenance costs.

Case 6. The public assumes all transit equipment costs and the developer assumes remaining capital costs and operating and maintenance costs.

Case 7. The public assumes capital and maintenance costs.

*Carpooling and work staggering program were assumed by the developer in all cases. All Capital costs include short-term interest charges.

COSTS

sts

			Delay Costs				
				90 Days		180 Days	
Case 5	Case 6	Case 7	No Delay	6% Inflation per year	12% Inflation per year	6% Inflation per year	12% Inflation per year
0	0	0	0	$139,100	$278,200	-	-
$120,120	$126,280	$106,680	0	$ 48,317	$ 96,634	$ 96,634	$ 193,267
0	0	0	0	$458,315	$916,630	$916,630	$1,815,000
0	0	0	0	$145,600	$291,200	$291,200	$ 582,400
0	0	0	0	$233,129	$466,257	-	-
$ 50,600	$446,840	$180,600	0	$425,700	$851,400	$851,400	$1,702,800

Certain conclusions concerning the economic impact of ISR on regional shopping centers, office complexes, and mixed-use developments may be drawn as a result of the analyses performed on the six case studies. These are presented below, broken down by type of cost.

1. Data Acquisition and ISR Application Preparation Costs

The case studies show that the expense incurred by a developer in collecting and analyzing traffic and air quality data for preparing an ISR application is relatively small, accounting for less than one-tenth of one percent of total project costs in most instances.

The use of EPA Technical Guidelines can significantly reduce the costs associated with data acquisition and preparation of an ISR application. It is estimated that the use of the Technical Guidelines rather than computer modeling, and assuming monitoring data supplied by a public agency, ISR application costs could be reduced from approximately $45,000 to $3,000.

2. Time-related Costs

Costs due to project delays will probably be most common over approximately the next two to five years. The projected short-term nature of the incidence of delay costs is due to the fact that many of the projects which will come up for review during the early years of the ISR program will have already gone through several years of planning, PERT scheduling, and other steps in the development process which limit the developers' flexibility in absorbing time delays. In addition, time-related costs may be incurred in part because delays are generally more common during the initial phase of implementing a new set of regulations.

It is the finding of this study that once the ISR program is fully underway, delay costs should be avoidable through the concerted efforts of both the developer and reviewer. Timing the review so that it occurs at the most appropriate point in the development process will be the responsibility of the applicant and may require alteration of other steps in the process, especially the sequence of traffic analyses. The duration of ISR is also an important time-related element, where expeditious treatment of applications by reviewers can contribute significantly to eliminating the occurence of delay costs.

The study examines two types of costs associated with construction delays that could be caused by ISR. The first is the cost of inflation during the period a project is delayed. The second is the opportunity cost incurred when a developer's money is tied to a project longer than anticipated, thus causing this money to be unavailable for use in a new investment. In three of the six projects analyzed, a 90-day delay due to ISR would reduce developer's return-on-investment by approximately 0.5 percent. In the other three projects, 90-day delays would cause a 1 to 7 percent drop in return-on-investment. In the case studies the 90-day delay costs represent 3.5 to 7.5 percent of the developer's front-end investment.

3. The Cost of Design Changes

Design changes, when they are necessary to prevent violation of the carbon monoxide air quality standard, are the principal source of ISR-related costs. However, the magnitude of these costs vary depending on the location and nature of the development involved. Of the four office park and mixed-use developments analyzed, two were found not to cause a violation of air quality standards for carbon monoxide and, therefore, would not have any design change costs. In order to correct conditions at the two developments which would result in violations, design change costs would be one-tenth of one percent of total project costs. The impact of these specific costs on return on investment is a 0.3 percent change for the mixed-use development and a 0.7 percent reduction for the office park, assuming the developer bears all costs. The effects of design-change costs in these two cases could be reduced significantly through public assumption of some or all of these costs (see Exhibit I-2).

Transit approaches to design changes would be feasible for both of the mixed-use and office developments that require design changes. In Project E, a savings of $192 per parking space could be achieved by replacing on-site parking with park-and-ride. In Project D, transit has a lower initial cost than highway related design changes. If the developer had to absorb all operating and maintenance costs of the proposed transit service, this approach to design-changes would be less attractive economically than highway modifications. The transit option would be attractive to the developer if the community absorbed operation and maintenance costs.

The six cases examined in the ISR study suggest that the effects of design-change costs are likely to be most significant for large shopping centers. This is due both to the nature of the traffic generated by these facilities and their difficulties in adopting certain low-cost transportation options (e.g., carpooling). In the two shopping center developments studied, design changes alone would increase project costs by 4 and 20 percent. In the latter case, which consists of an expansion of existing facilities, an 8 percent increase in rents or some public funding of design changes would enable the development to proceed as planned, while meeting the financial feasibility criterion of the developer. In the former case, the shopping center is located in a heavily congested area. Although the immediate area around the project is well-served by transit, 60 percent of the shopping center's trade depends on commuter automobile trips by persons living outside of the project's vicinity. Unless the public assumed responsibility for major roadway modifications, ISR would be likely to prevent the development from being built as planned. However, the development could be built if it were reoriented to serve the local population which has good transit service.

Design changes to prevent excessive carbon monoxide accumulations indicate the need for ISR. The ISR study found that the air quality problems necessitating design changes will persist over time despite the gradual replacement of old, high-emitting cars with newer and cleaner ones. However, the costs of design changes will decrease as the car population becomes cleaner (see Exhibit I-3).

EXHIBIT I-3
DESIGN CHANGE COSTS
The Impact of Automobile Emission Control Devices on Design Change Costs Over Time

	Highway - Related			Transit - Related[2]		
	1980	1985	1990	1980	1985	1990
Case B	$1,250,000	$1,250,000	$1,167,000	**	**	**
Percent of base year cost	92%	92%	86%			
Case D	$539,000	$132,000	$000	$90,000	$20,000	$000
Percent of base year cost	37%	9%	0%	82%	18%	0%
Case E	$354,000	$40,000	$40,000	$155,250	$40,000	$40,000
Percent of base year cost	40%	11%	11%	40%	26%	26%
Case F	$300,000	$200,000	$000	**	**	**
Percent of base year cost	32%	21%	0%			

** Transit ridership already at maximum reasonable volume.
Work staggering and carpooling not applicable.

[1] Costs in constant dollars based on original completion date (base year) by project.

[2] Costs do not include annual operating costs.

D. Impact on Size and Location of Development

The study analysis indicates that the impact of ISR on location will generally be to reinforce existing trends of suburbanization. In the case of shopping centers it was found that ISR and its attendant costs may provide developers with a marginal incentive to locate in suburban areas where air quality is relatively good and ISR-related costs would be minimized. The effect of ISR on suburbanization of office buildings was found to be small compared to the effects of the state of the economy and the availability of financing and labor. Short of denial of a permit for construction, ISR was found to have no effect on the location of mixed-use developments.

In the case of shopping centers, ISR was found likely to have a much greater effect on the size rather than on the location of shopping centers. The economics of shopping center developments above and below the triggering point for review were found to be insufficiently different for a developer to feel a large degree of hesitancy about reducing the size of a facility to avoid the potential costs and undertainty of applying for an ISR permit. The sizes of office buildings and parks probably will not change as a result of ISR. Rather, office building developers will tend to reduce the sizes of their parking facilities and rely on transit, carpooling, staggered work hours, or off-site parking instead. There was insufficient information to evaluate the effects of ISR on the sizes of mixed-use developments.

E. Administration

A number of potential problems in implementing indirect source regulations were identified from the experience of three areas which have already initiated review programs:

1. Data Acquisition and Analysis

Difficulties in data acquisition and analysis have been expressed by both developers and reviewers. Questions concerning assumptions and techniques to be used in monitoring, modeling, receptor siting, and traffic projections were most frequently raised. Assistance from the Federal EPA in preparing guidelines not only seems to be desired by reviewers, but also could be useful in terms of eliminating a duplication of efforts at the regional and local levels and in expediting the preparation and dissemination of essential guideline material.

2. Application Preparation and Submission

Minimizing potential problems connected with when to initiate ISR will require efforts on the part of both developers and reviewers. The developer must adjust his planning process so that ISR is initiated at the most appropriate time. The adjustment should include reassessing the timing and nature of traffic studies required to complete the ISR application.

On the part of the reviewer, the three area cases show that, for various reasons, early review as encouraged by the Federal EPA is not always preferred at the state and local level. Although concerns about allowing time for local involvement have some merit, it is also important to understand the impact that postponement may have on developers.

Timing problems have also been experienced in connection with highway projects in the three study areas although efforts are being made to integrate an air quality review into the overall highway planning process.

3. The Review Process

In order to minimize adverse economic impacts and reduce uncertainty, an expeditious review process can provide a significant benefit for developers.

In the state and local experience cases, however, there is evidence that reviewers are encountering problems processing ISR applications within 90 days or, in some cases, 180 days. One of the reasons for this seems to be inadequate staffing. Additional manpower funding, accelerating training programs for existing staff, and even the creation of one or more positions of "roving reviewers" could all serve to eliminate problems related to the length of processing time.

4. Conditioning ISR Permits

Along with timing, conditions to permits seen to have caused the most difficulties in the study areas administering ISR. The major issues raised were with regard to timing of design changes that have public involvement and determination of the effectiveness of alternative design changes.

The issue of possible delays related to public involvement in design changes can be resolved by issuing a permit in cases where developers will institute an interim bus system or similar alternative to service a facility until the permanent design change is completed.

The question of the effectiveness of design changes has no easy solution and is an area where contributions by Federal EPA in the form of case studies and technical analyses could provide significant benefit.

PART II
INTRODUCTION

A. Background of the Study

The purpose of this study is to determine the potential economic and land use impacts of the indirect source regulations (ISR) promulgated by the U. S. Environmental Protection Agency (EPA).[1] These regulations were established in response to a D. C. Court of Appeals order of 31 January 1973, in the case of National Resources Defense Council v. EPA, which directed EPA to ascertain that state implementation plans (SIP) adequately provide for maintenance of the national ambient air quality standards (NAAQS).

EPA subsequently determined that no state plan contained adequate provisions for controlling indirect sources of air pollution, with indirect sources defined as new facilities which may generate significant amounts of automobile traffic. Such facilities include but are not limited to highways and roads; parking facilities; retail, commercial, and industrial facilities; recreation, amusement, sports, and entertainment facilities; airports; office and government buildings; apartment and condominium buildings; and educational facilities.

On 18 June 1973, EPA promulgated regulations requiring that all states submit plans for preconstruction review of indirect sources by 15 August 1973. By the time of the August deadline, no state had submitted the required plan, although in the period prior to February 1974 fourteen state plans were officially offered. Two of these plans--those submitted by Florida and Guam--were fully approved by EPA, while the plan submitted by Alabama was deemed acceptable except for a procedural deficiency related to public comment provisions.

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[1] Although these regulations are called "complex source" regulations in some states, the term "indirect source" will be used exclusively in this report in accordance with accepted Federal practice.

For those states which either submitted deficient plans or failed to submit any plans, EPA promulgated regulations on 25 February 1974 covering the review of new indirect sources of air pollution. These regulations are to be withdrawn if a state later offers an approvable plan. The federally promulgated indirect source regulations will become effective for any facility on which construction has begun on or after 1 January 1975. EPA initiated review procedures on 1 July 1974 to help developers secure approval in advance for projects on which construction is planned soon after 1 January 1975.

The concept of indirect source review is primarily to regulate the localized concentration of carbon monoxide (CO). Photochemical oxidants are to be considered only in the review of airports and large highway segments (50,000 or more vehicles per day) or in conjunction with the application of other control measures.[1] Because the automobile is the primary source of CO emissions, facilities will be reviewed in terms of their relative contribution to congestion through examination of their traffic flow characteristics.

The regulations specify different sizes of facilities to be reviewed in "urban" and "non-urban" areas. The nation's Standard Metropolitan Statistical Areas (SMSA's) constitute the "urbanized" areas.

Under these regulations, the following indirect sources must be reviewed:

Roads and Highways

(Within 10 years of construction in an urban area)

New 20,000 vehicles per day (average)

Modified 10,000 vehicle increase per day over existing traffic (average)

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[1] Pursuant to parking management regulations, facility-by-facility review in 19 major urban areas must include an evaluation of impact on both localized CO and vehicle miles traveled (the latter also providing an indicator of contribution to photochemical oxidants).

Airports

(Within 10 years of construction in an urban or non-urban area)

New	50,000 operations or 1.6 million passengers per year
Modified	50,000 operation per year increase over the existing level, or 1.6 million passenger increase per year

Other Indirect Sources

	Urban Area	Non-Urban Area
New	Parking for 1,000 cars or more	Parking for 2,000 cars or more
Modified	Parking for 500 cars over existing number	Parking for 1,000 cars or more over existing number

In addition to information concerning the amount of automobile traffic to be generated by a facility, with their application for approval developers must submit measured or estimated air quality data at the site of the project prior to and after construction.

EPA is encouraging state agencies that develop their own programs to work with appropriate local governmental agencies.

B. Study Goal and Objectives

Before the indirect source regulations become effective, the EPA Office of Planning and Evaluation (OPE) decided that a study should be undertaken as a critical part of its efforts to evaluate thoroughly the possible economic impact of EPA standards and regulations and to assist in the development of land use policy within the agency. In addition, the study should be designed to address some of the concerns related to the proposed indirect source regulations that were raised during the public comment period (November 1973).

Indeed, the public comments on the regulations have focused on several key issues with respect to potential economic and land use impact. For example, in terms of economic impact, one group presented the following argument in support of not only encouraging but also facilitating early and judicious review and decision on indirect source applications:

> For any project of the size for which a permit would be required, the work and expense that would be involved would prohibit a project proponent from proceeding to a point immediately prior to actual erection of the structure without assurance that the development could proceed to completion. Whether the project is private or public, the land must be acquired, or, at a minimum, options for land acquisitions obtained at considerable expense. Preliminary engineering must be completed at least with respect to the feasibility of the site for the proposed source. In many cases, zoning variances must be secured and supported by detailed documentation on design and impact. Preliminary architectural plans must be prepared and when approved, converted over an extended period of time into actual working drawings. Moreover, with respect to all public projects and some private projects, detailed environmental impact statements must be prepared under the National Environmental Policy Act or comparable state legislation. It is not unusual for such preparatory work to involve expenditures of millions of dollars. Indeed, certain phases of this work, particularly site preparation, are paid for through interim financing, which could not be obtained unless the project had already been approved by the Director.
>
> In view of the "front end" expense involved in the development of an indirect source application it is essential, for public and private project proponents alike, that the Director's determination be made as early as possible. In the case of a private project, the right to an early determination reduces the likelihood that a worthwhile project will be abandoned by reason of the owner's or operator's uncertainty of his ability to proceed. In the case of a public project, e.g., schools, hospitals, redevelopment projects, roads and airports, an early determination will avoid the unwarranted expenditure of public funds.[1]

Other public comments of an economic nature have been related to the consequences of the increased risk and uncertainty for the developer that may result from implementation of the indirect source regulations. Consequently, an implicit goal of this study is to try and reduce or eliminate some of the most important areas of uncertainty to avoid imposing undue hardship on the development industry.

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[1] National Realty Committee, Inc., Comments on Proposed EPA-Promulgation of Indirect Source Regulations for Inclusion in State Implementation Plans, submitted to the Environmental Protection Agency on 29 November 1973, pp. 22-24.

With regard to possible land use repercussions, public concern has been expressed that the regulations may lead to a proliferation of many small developments. Some groups voicing this opinion feel that such a trend would be contrary to the intent of the regulations since it might encourage a continuation of "urban sprawl" and its environmentally detrimental effects, including increased area-wide vehicle miles of travel.

The EPA response to these land use-related comments is as follows:

> The Administrator certainly does not intend and does not believe that the encouragement of small, strip-type developments will be the effect of these regulations. First, it should be stressed that the primary purpose of the regulations is to ensure that proposed projects are designed and located in a manner consistent with air quality requirements. If the proposed project would interfere with a national standard, changes in the design, or extension of mass transit should be considered. Only if a project cannot be made compatible with air quality requirements would it be necessary to prevent its construction. Furthermore, as long as there are economic incentives favoring development of large projects, the Administrator does not believe that developers of larger projects will change their scope of operations solely for fear of indirect source review. As is discussed below, developers will be encouraged to submit their plans for indirect source review at the earliest stage in the development process that the required information becomes available. Thus, applicants should be able to obtain guidance and a final determination from the reviewing agency at a point where total project investment and expenditures for the source will be quite low, and will usually be able to make necessary design modifications so that a large indirect source can receive formal approval.

A determination of the validity of the assumptions upon which the above statement is based has provided another frame of reference in formulating the study design.

In summary, to further the Office of Planning and Evaluation's efforts both to develop land use policy within the agency and to evaluate thoroughly the economic impact of EPA regulations, the primary goal of this study is to determine the economic and land use impacts of indirect source review. To achieve this goal, the study objectives were defined as follows:

(i) To assess the magnitude and incidence of costs to the developer associated with indirect source regulations and resulting from possible design changes necessitated by review requirements, time delays, and any additional data demands generated by the review process.

(ii) To determine the impact of the indirect source review regulations on developer location and facility design decisions, and to assess the probable impact of these decisions on land use development patterns and area patterns of vehicle miles traveled.

(iii) To identify problem areas in administering the regulations and to suggest guidelines to eliminate or ameliorate these problems.

C. Scope of Work

1. Overview

The entire study encompassed a period of just three months. This limitation to the scope of the project was imposed because OPE felt (i) that it was essential to identify tentative if not final answers to questions of economic and land use impact as well as potential implementation issues and (ii) that this should be soon enough to allow several months for evaluating the study findings and recommendations prior to the effective date of the regulations (1 January 1975).

Ideally, the breadth of the study objectives would call for an analysis of sufficient magnitude to permit statistical inference to be drawn by categories of type and size of development and geographic location. However, the time constraints of the project precluded such an approach. Consequently, three more limited information sources were used which, in combination, could provide a significant contribution to meeting the study objectives. These sources were:

- Six development-specific case studies.
- Three state and local experience studies.
- General discussions, interviews, and literature review.

Each of the three sources is discussed in detail below. The relationship of the input from these sources to the overall study plan is graphically presented in Exhibit II-1.

2. Case Studies

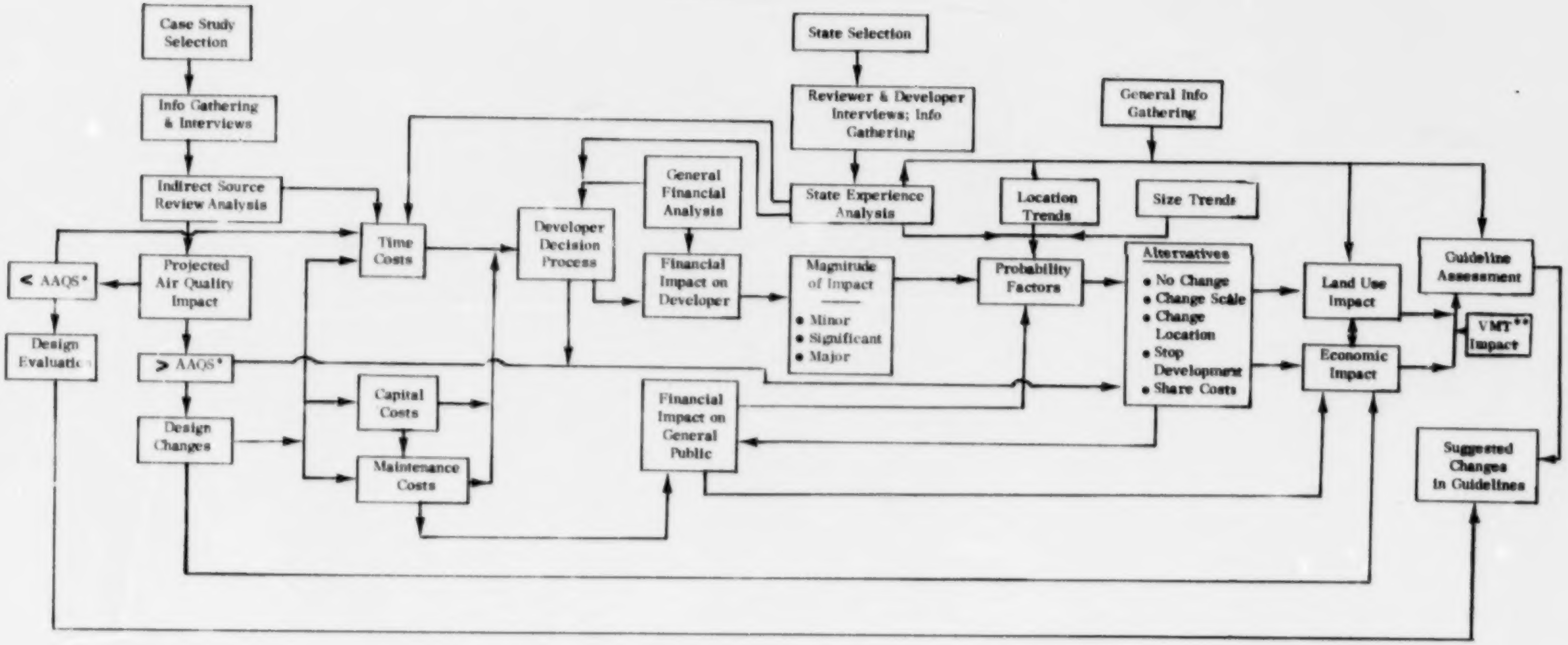
a. Introduction. In addressing the study objectives it was considered essential that there be a means of testing the likely impact of ISR within the context of an actual application. The case study methodology was selected as the most appropriate approach to use for this purpose. Each case represents an existing development. The economic impacts were determined by working ISR-related costs into the actual financial statements for each facility.

b. The Selection Process. Six developments were selected as subjects for the case studies. These represent three types of facilities: shopping centers, office buildings, and mixed-use (commercial and residential) complexes. OPE had decided that the focus of the case study portion of the project should be on these types of development rather than on event-oriented facilities (such as sports stadiums) or on government-sponsored projects (such as highways and airports).

Each of the cases represents a development which is either completed or under construction. The reason for choosing facilities in these stages of development rather than facilities that were still in the planning stage was the concern that the study process not bias or delay progress for a proposed project, which will eventually have to undergo zoning hearings, indirect source review, parking management supply regulatory assessment, or other environmental proceedings.

Exhibit II-2 shows the criteria for selection as well as a flowchart of the case study selection process. As a first step, contacts were made with each of the 10 EPA regional office representatives and state air pollution

EXHIBIT II-1
STUDY PLAN: FLOW DIAGRAM

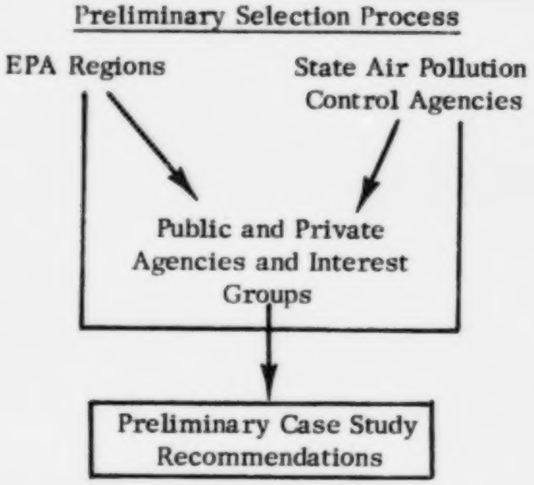

Case Study Selection
Info Gathering & Interviews
Indirect Source Review Analysis
Projected Air Quality Impact
< AAQS*
Design Evaluation
> AAQS*
Design Changes
Time Costs
Capital Costs
Maintenance Costs
Developer Decision Process
General Financial Analysis
Financial Impact on Developer
Financial Impact on General Public
Magnitude of Impact
• Minor
• Significant
• Major
State Selection
Reviewer & Developer Interviews; Info Gathering
State Experience Analysis
General Info Gathering
Location Trends
Size Trends
Probability Factors
Alternatives
• No Change
• Change Scale
• Change Location
• Stop Development
• Share Costs
Land Use Impact
Economic Impact
Guideline Assessment
VMT** Impact
Suggested Changes in Guidelines

*AAQS - Ambient Air Quality Standard for Carbon Monoxide.
**VMT - Vehicle Miles Traveled.

EXHIBIT II-2
FLOWCHART OF CASE STUDY SELECTION PROCESS

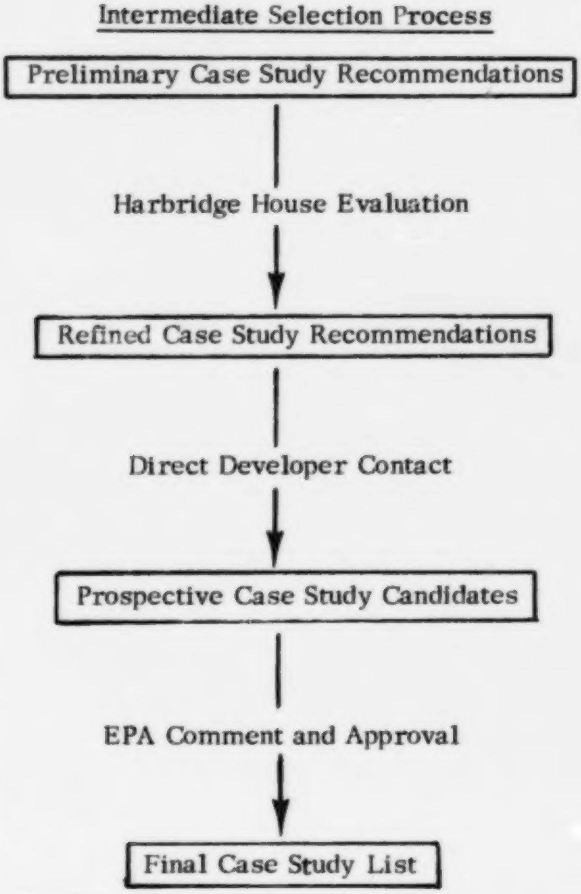
Criteria

1. Nature of development*
2. Timing
3. Quality and depth of information resources


Preliminary Selection Process
EPA Regions
State Air Pollution Control Agencies
Public and Private Agencies and Interest Groups
Preliminary Case Study Recommendations

Criteria

1. Geographic distribution
2. Intercity/suburban/rural mix
3. Locations with and without mass transit
4. Locations with and without transportation control plans
5. States with and without indirect source regulations
6. Different scales within a specific development category
7. Phased developments vs. single-concept projects


Intermediate Selection Process
Preliminary Case Study Recommendations
Harbridge House Evaluation
Refined Case Study Recommendations
Direct Developer Contact
Prospective Case Study Candidates
EPA Comment and Approval
Final Case Study List

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*Includes type, size, and location.

control officials who referred Harbridge House to further sources of information, including state departments of transportation, developers, or contractors and planning agencies. Forty-one cases were subsequently recommended by the people contacted.

After screening the recommended developments based on the case study criteria and conducting follow-up discussions with government officials and developers, the list of 41 cases was eventually reduced to the six most suitable facilities. In terms of geographic distribution, these include one case each from the Mid-Atlantic region, the South, the Mid-West, and the Far West, and two cases from the Pacific Coast region. By type of development and local siting, the cases fall into the following categories:

- Two regional shopping centers (one urban and one suburban).
- Two mixed-use developments (both urban).
- Two office parks (one rural and one suburban).

c. Case Study Objectives. The findings of the case studies were most important as input to the cost impact portion of the report. Although other types of information were obtained during the preparation of the cases, the case studies were specifically focused upon two objectives:

(i) To apply EPA Technical Guidelines to existing developments to determine whether as originally designed the quidelines could be applied easily to the development process and to evaluate whether the facilities would hinder the attainment or maintenance of national ambient air quality standards for CO.

(ii) To determine whether the financial feasibility of a project could be jeopardized by ISR-related costs (e.g., for consulting studies, permit fees, design change requirements, and time delays).

The technical guidelines referred to above were prepared by the EPA Office of Air Programs (OAP) in order to provide review agencies with a screening technique for proposed indirect sources, pursuant to 40 CFR 52. 22 (b). The purpose of the guidelines is to provide a means of identifying key design and operating criteria which, if met, should ensure that NAAQS for carbon monoxide are met in the vicinity of indirect sources.

Because monitoring in the vicinity of indirect sources has indicated that the highest concentrations of CO occur near exit/entrance gates, at nearby intersection approaches, or along access roads, the guidelines focus on design and operating parameters for these areas. The four key design and operating parameters of emission levels are:

- Volume demand flow rate in each lane.
- Volume demand to capacity ratios in each lane.
- Functional type of roadway.
- Average highway speed or posted speed limit, whichever is lower.

The guidelines were used exclusively to determine whether the case studies would violate NAAQS. In n actual situation, however, the final determination of violation may be based solely on the methodology presented in the guidelines, since the alternative of monitoring and modeling is also available to ISR applicants. This is explained in the Preface to the guidelines:

> If this methodology indicates that there may be difficulty in meeting the 1- or 8-hour NAAQS for CO, this is not necessarily grounds for denial of a permit for operation of the source. The methodology is intended as a conservative screening technique to identify situations in which a potential problem may exist. Should such a problem be indicated, the option for more complete analysis should be offered.

As a result of applying the guidelines methodology, three of the cases were cited as requiring relatively significant levels of improvement to prevent violation of NAAQS. For each of these cases a variety of "design change" scenarios were developed to determine what combinations would enable the project to fulfill

ISR requirements at the lowest cost to the developer. The design changes and their nature and cost implications for the real estate development industry are discussed in detail in Part IV of this report. The term "design changes" as used in this report refers to roadway and gate modifications, mass transit improvements, and other actions which will limit automobile congestion and improve traffic flow in general.

In each of the cases, the results of applying the guidelines methodology were compared to Federal standards for CO (one-hour: 35 ppm or 40 mg; eight-hour: 9 ppm or 10 mg). State variations in standards, where relevant, were not considered--partly to protect the identity and location of the developments being analyzed. Six developers contributed substantially to the study by providing financial data which were used to project the economic impact of ISR on specific sources. In order to protect the confidential nature of some of these data, all of the case studies have been disguised.

The time limitations of the study permitted the preparation and assessment of only six case studies. Because this number does not represent a statistically valid sample size, care must be taken in using the cases to draw general conclusions on overall economic impact by either type of development or type of developer. In addition to the diversity of organizational forms, the types of activities, and the financial feasibility criteria used, wide variations in cost by geographic area and over time preclude inferring more from the case studies than what is specifically covered by the two objectives listed above.

3. State and Local ISR Experience Studies

a. Introduction. In order to provide a broader approach to assessing ISR impact than is possible through an evaluation of six case studies, an analysis was made of the experience to date in three areas of the country that have already initiated some form of indirect source review. The information obtained from this approach was evaluated to determine whether there was evidence of adverse economic and land use impact as a result of the review process. Policy and procedural issues which may have arisen during the implementation of ISR were also investigated.

b. The Selection Process. The first step in selecting the three most suitable areas was a survey of all 50 states to determine their current position with regard to promulgating and implementing indirect source regulations. Information was obtained through direct contact with representatives of each state's department of air pollution control or the equivalent agency, supplemented by a review of indirect source regulations for particular states. Each state was then classified according to its regulatory status as follows:

Regulatory Status	Number of States
Regulations in effect at state level and approved by EPA	2
Regulations in effect at state level but not approved by EPA	8
Regulations finalized but not yet in effect at state level	5
Regulations in draft form or in public hearings	14
States without legislative authority to promulgate indirect source regulations	10
States still drafting regulations	13
	52[1]

It was decided that the states from the first two categories would make potentially suitable candidates and that the final selection would be based upon the length and magnitude of their experience to date. A brief description of the review experience of the states within these two categories follows.[1] As the descriptions illustrate, state regulations can differ from one another as well as from the Federal regulations.[2] Nevertheless, these differences are often useful in highlighting potential strengths or problems within the regulations.

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[1] Includes Puerto Rico and the District of Columbia.

(1) Regulations in Effect at State Level and Approved by EPA

- Alabama

Indirect source regulations have been in effect in Alabama since 23 September 1973. Designated areas are defined as counties with a population of 200,000 or more. Parking space size cutoffs for review are the same as the Federal limits for "designated" and "non-designated" areas. Three cases related to proposed highway construction have been reviewed. So far the state has faced no significant opposition to the regulations. On the contrary, public comment has focused more on the designation of air quality maintenance areas (AQMA's) than on indirect source review.

- Florida

Indirect source regulations have been in effect in Florida since 15 December 1973. All unenclosed parking lots with a capacity for 1,500 or more vehicles and all enclosed facilities with a capacity for 750 or more vehicles are subject to review. No "designated" versus "non-designated" area differentiation is made. So far an estimated 36 applications have come up for review--12 private development projects and 24 state road projects. Amendment of the current regulations is anticipated to tighten some portions and ease others. No major problems have been encountered in implementing the regulations. Florida has additional review experience in connection with its "Development of Regional Impact" (DRI) assessment process.

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[1] The descriptions represent the status of each state as of 1 June 1974.

[2] EPA has no direct control over the nature of the state-adopted regulations provided they are at least as strict as the Federal regulations.

(2) Regulations in Effect at State Level but Not Approved by EPA

- Kentucky

About six facilities with associated parking facilities and several state highway projects have been reviewed since Kentucky's regulations became effective on 11 January 1974. Designations for review are made according to the nature of a parking facility:

--New unenclosed facility with more than 1,500 spaces.

--New partially or totally enclosed facility with more than 750 spaces.

--Increment in parking spaces to more than 1,500 spaces at unenclosed facility or by 1,500 spaces.

--Increment in parking spaces to more than 750 spaces at partially or totally enclosed facility or by 750 spaces.

--Unenclosed facility with more than 1,500 spaces which will be increased in capacity by 25 percent or more.

--Enclosed facility with more than 750 spaces which will be increased by 25 percent or more.

- Maine

In Maine indirect source review is in part controlled by existing legislation--the state's Location of Development Law (38 MRSA, Section 481-488)--which has been in effect for about four years. Under this law all structures with 60,000 square feet of ground area and all developments of 20 acres or more are subject to environmental review. Some additions to the regulations will be needed to gain EPA approval as a mechanism for indirect source review. To date only one development within the Federal regulatory definition of an indirect source has come up for review.

- Nebraska

Nebraska's regulations have been in effect since 26 February 1974 but have not yet been submitted to EPA for approval. Review in "designated" areas is required for constructing new parking facilities of 1,000 or more spaces or modifying facilities by adding 500 spaces or more, or for inducing 1,000 vehicle trips in one hour or 5,000 vehicle trips in eight hours. In "non-designated" areas, the review figures are raised to 2,000 new spaces or 1,000 additional spaces. So far no applications have come up for review but one is anticipated shortly--a modification of a roadway.

- Nevada

Indirect source regulations in Nevada became effective on 27 March 1974. Cutoffs for review are as follows:

--Shopping centers	500 parking spaces
--Drive-in theaters	500 parking spaces
--Parking lots	500 parking spaces
--Garages	500 parking spaces
--Sports complexes	1,000 parking spaces
--Commercial developments	1,000 parking spaces; 500 sleeping or room accommodations
--Industrial developments	1,000 parking spaces
--Institutional developments	1,000 parking spaces; 500 sleeping or room accommodations
--Amusement parks	1,000 parking spaces
--Recreation areas	1,000 parking spaces
--Residential developments	500 units
--Highways	10,000 designed daily traffic
--Sewer, water, power, or gas lines	5,000 designed new connections
--Airports	25,000 landings and take-offs annually

--Any single source which can cause, allow, or permit the emission of an air contaminant of greater than 50 pounds/hour.

--Any combination of single sources located at a single premise which can cause, allow, or permit the emission of an air contaminant of greater than 50 pounds/hour.

--Any single source, upon notice from the Director.

So far, two or three applications have been submitted for review.

- New Hampshire

This state's regulations went into effect on 11 January 1974. New facilities with 750 spaces or more or modifications of 500 or more are subject to review. To date no facilities have been reviewed.

- New York

New York's regulations have been in effect since 5 November 1973. Eight major facilities with associated parking (five shopping centers, two mixed-use developments, and one convention center) are in various stages of review, in addition to a number of highway projects. It is the opinion of state air pollution control officials that developers feel intimidated by the regulations and have been holding back on submitting applications. Particular concern has been expressed by the private sector over the requirement that a facility not exceed once in 10 years one-half the difference between existing CO levels and NAAQS. The state is now preparing an amendment to allow a facility to generate CO concentrations of up to three-quarters the difference between existing air quality and NAAQS. All facilities with 1,500 spaces or more are reviewed, except in the County of New York (Manhattan) where all garages or parking facilities, regardless of size, are subject to review.

- Oregon

Since 1 January 1972 Oregon has had an effective pre-construction review procedure for (i) new facilities within the municipal boundaries or five-mile limit of any city with a population of 50,000 or greater or (ii) any parking facility used for the temporary storage of 50 or more motor vehicles or having two or more levels of parking. More than 100 cases have been reviewed under these regulations, with about 20 applications a month being received during the spring. Some changes are now being drafted to make this procedure suitable for indirect source review.

- Vermont

Indirect source regulations have been in effect in Vermont since 6 November 1973. EPA approval is currently pending. Facilities which have or will have 200,000 square feet of parking lot space as well as all facilities to be located in a town or municipality where the NAAQS for CO is exceeded are subject to review. No facilities have been reviewed so far under these regulations.

* * * * *

Upon completion of the survey, it was decided that Florida and Oregon would make excellent areas for in-depth study. Florida's program has met Federal approval and a range of large-scale development projects in the state have already undergone review. In addition, the existence of the state's Development of Regional Impact Program gives an extra dimension to the ISR experience in Florida.

Although not yet approved at the Federal level, Oregon's review process has covered more cases in total than any other state. The triggering point of 250 parking spaces within an SMSA in Oregon is much lower than the Federal limit; therefore, Oregon's experience is important in terms of the possible impact of ISR (or even parking management plans) on small developers. The imposition of transit-related conditions is another significant feature of this state's program.

The remaining states presented difficulties in attempts to select a third area for study. Either the number of cases which had been completely reviewed were small and/or the cases that were reviewed were primarily highway construction projects rather than private developments.

After some discussion with EPA members of the study committee, a decision was made to examine local review programs in order to determine whether a suitable local area of study could be identified. This decision to look for a substate experience was consistent with EPA efforts to encourage review, wherever appropriate, at the local level.

Subsequent inquiries identified Philadelphia as a good local-level candidate. In addition to providing insight into the prospects and problems of local review, the Philadelphia experience is interesting for a number of other reasons. Briefly, Philadelphia's Air Management Regulation X, adopted on 20 August 1972, was basically a mechanism to incorporate air quality considerations into the planning process. Under this regulation the following types of development were required to submit an air quality impact statement:

--Industrial or commercial facilities with 500,000 square feet or more of floor space.

--Residential facilities with 100 or more dwelling units.

--Highways.

--Mass transit facilities.

On 4 May 1974 Regulation X was amended to more closely resemble the Federal indirect source regulations. The cutoff points for review have been maintained at parking spaces for 250 or more vehicles within the central business district (CBD) and 500 or more parking spaces outside the CBD. The regulation addresses all pollutants, not just CO.

Files on 16 downtown projects are currently being maintained; all but three of these are public projects. To date three cases have completed the review process.

c. Evaluation. In each of the three areas--Florida, Oregon, and Philadelphia--the records of the reviews undertaken were examined. Information on the size and types of projects; number of approvals, conditional approvals, or disapprovals; timing; location; mass transit access; and other pertinent data are presented in Appendix A.

In addition to a review of the records, interviews were conducted with ISR officials and developers who had participated in the review process. Planning commissions, state departments of transportation, lending institutions, and other involved parties were also contacted.[1] The information, opinions, and ideas obtained from these various sources were ultimately brought together and evaluated for points of disagreement, areas of misunderstanding or confusion, and/or evidence of commonality. The findings, in turn, were related to the appropriate study issues, including problems or guidelines for ISR implementation and potential economic and land use impacts.

4. General Sources of Information

During the course of the project, information was collected from a wide range of printed literature; numerous discussions and interviews with Federal and regional EPA officials, state and local air pollution control office representatives, developers and developer organizations, members of the financial community, and traffic consultants; and Harbridge House and EPA-related research and experience in the areas of real estate development, transportation and traffic engineering, cost analysis, and environmental impact assessment.

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[1] The distribution of persons interviewed for the state and local experience is as follows:

Florida	6 state air quality officials
	13 regional and local air quality officials
	2 state planning officials
	2 state DOT officials
	5 developers
Philadelphia	5 city air quality officials
	1 state air quality official
	2 city planning officials
	2 state DOT officials
Oregon	3 state air quality officials
	10 developers
Lending Institutions	15 (some of these serve more than one area)

D. Organization of the Report

Instead of presenting information using the three sources cited above as headings, this report has been divided into a series of topical categories. Insight and data derived from all sources on a particular subject are, therefore, presented in some portion(s) of the report.

The report has been organized into five major parts as follows:

Part I	Executive Summary
Part II	Introduction
Part III	Potential Economic Impact of ISR
Part IV	ISR Impact on the Location and Size of Development
Part V	Administration

Part I of the report presents the study conclusions and recommendations. The recommendations focus on actions which can be taken immediately to ensure greater equity and efficiency in implementing ISR. The suggestions relate to both policy and procedural questions and are presented approximately in order from the most to the least important in terms of the significance of the issue(s) which they address.

This part is followed by this introduction to the main body of the report. The introduction presents a brief background of the regulations as well as a description of the study objectives and scope of work.

Part III explores the potential economic impact of ISR, as evidenced by the case studies, the state and local experiences, and general comments from developers and lending institutions, with the major emphasis being on the case studies. As used in this report, the term "economic impact" actually refers to financial impact. The impacts discussed here are basically those borne by the developer, although in some cases they fall upon the general public (e.g., for transit and roadway improvements). The entire gamut of economic costs, such as those that may be related to job losses or changes in tax revenues, are not dealt with in this report.

Part IV focuses on possible changes in the location and size of new developments that may result from implementation of the regulations. This is a particularly difficult area to pin down with any degree of precision, because of several relatively new factors which are also impacting on developers' decisions concerning size and siting. These factors include inflation and tight money, construction material shortages, delays in urban renewal programs, and so forth. However, some evidence on the level of impact which may be anticipated has been derived from state and local experiences, and has been compared with current and future trends.

Part V focuses on the key administrative and procedural issues inherent in implementing ISR. The discussion in this part covers questions of timing, staffing, data reliability, regulatory interpretation, coordination with other agencies, and so forth. The analyses of two states and one city which have already initiated a review process provide the basis for much of the material presented in this discussion.

PART III
POTENTIAL ECONOMIC IMPACT OF ISR

A. Introduction

In the past the Council on Environmental Quality, the Environmental Protection Agency, and the Department of Commerce have conducted a series of studies to assess the economic impact of air and water pollution abatement requirements on a number of industrial activities such as baking, cement, electric power generation, fruit and vegetable canning and freezing, iron foundries, leather tanning, non-ferrous metals smelting and refining, petroleum refineries, pulp and paper mills, and steel-making. Although a number of these industry categories encompass a wide range of business types--from small, single-proprietor companies to vertically integrated, multinational corporations--none approaches the complexity and diversity of the real estate development industry which is the subject of this impact assessment.

The types of firms involved in the real estate development industry can range from publicly or privately held development corporations and governmental agencies (e.g., state departments of transportation) to small-scale, single-project developers. The financial criteria used to determine whether a project will be a "go" or "no-go" situation will vary, depending on whether financial feasibility is based on the potential for the project to increase rental or property value, the prospect for "mortgaging out," the percent of cash in before cash out, the return on developer's equity, tax shelter considerations, or the prospects for vertical integration (the presence of internal profit centers that must be supported).

Further complicating an assessment of the potential economic impact of indirect source regulations is the fact that some of the measures which could be used to minimize mobile source pollution are outside exclusive control of the developer. Such measures (referred to hereafter as "design changes") include off-site highway and transit improvements. Thus, in contrast to the owners of stationary sources who can control the timing and cost allocation of installing scrubbers or other abatement devices, developers may find that they can exert little or no control over the scheduling priorities and/or the allocation of state and Federal funding needed to implement a particular design change.

In order to assess the impact of ISR on the real estate development industry, it is necessary to understand the economic posture of the industry. Several segments of the industry are currently facing economic problems and obstacles which are far worse than anything they have experienced in the last three or more decades. Inflation, high interest rates, tight money, and shortages in certain critical building materials are the most commonly cited causes of the developer's economic problems. In the analyses of the six case studies, only inflation has been incorporated to reflect current and projected conditions. There has been no attempt to determine the possible effect of changing interest rates, tight money, material shortages, or other factors on ISR-related costs. Nevertheless, it is important for the policy-maker and ISR-reviewer to recognize that equity and efficiency in applying the new set of regulations may be crucial to real estate development within the present-day context of economic uncertainty.

Briefly, problems currently affecting the industry include the following:

- Inflation - Real estate development is experiencing escalation in the costs of both materials and labor. For example, the price of residential construction has been rising at a rate of one percent per month.[1] Shopping centers, however, have been averaging increases of approximately 2 percent per month, or 25 percent during 1973.[1] Construction materials alone are projected to increase in price by 18 percent in 1974.[2]

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[1] "The Housing Slump Cripples Even the Giants," The New York Times, 28 July 1974, p. 1, section 1.

- Interest Rates and Tight Money - The high cost of money has affected developers in several ways. To begin with, as the cost of financing increases, direct cuts are made into the developer's cash flow return. Presently, short-term loans are costing upwards of 14 percent and long-term loans are up around 9 3/4 to 11 percent.[3] Furthermore, mutual savings banks and savings and loan associations, which have traditionally financed construction projects and mortgages, are draining off their resources to the short-term money market because of the Federal ceiling on rates of interest charged to their depositors. Long-term money is not always available.[4] The higher cost of long-term money and its scarcity will limit the supply of new developments to areas where the costs can be (at least partially) passed along in higher prices or increased rents.

  Finally, with mortgage rates so high, people cannot afford to buy homes. A securities firm estimates that every one-point rise in mortgage rates drops 250,000 of California's seven million families out of the housing market.[1] With new housing curtailed, localities cannot grow to support retail and commercial activities, thus impacting on the developer from the demand side of the equation.

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[1] "Shopping Centers Pressured," The New York Times, 4 June 1974, p. 47.

[2] "High Price Increases Hit the Raw Materials Used in Construction," Wall Street Journal, 23 May 1974, p. 1.

[3] New England Merchants National Bank, 8 August 1974.

[4] "The Housing Slump Cripples Even the Giants," op. cit.

- Building Material Shortages - Shortages have been identified in steel, wood products, gypsum, cement, and lighting and plumbing fixtures. Steel is by far the most important material to building contractors. The steel shortage is sufficiently critical for the steel industry to be cutting back on its product line in order to speed up deliveries. Therefore, developers no longer have the same amount of flexibility they used to have; in addition, they may end up paying more than necessary for a higher grade product, simply because the lower grade item is not being produced.

- Energy - The problems of the uncertainty of money market lending rates and the availability of building materials are aggravated by the unknown magnitude of the nation's energy problem. Developers have no long-term perspective on how life styles will be affected by shortages in gasoline and other petroleum products 10, 20, or 30 years from now. They are, however, reluctant to plan developments that are wholly or largely dependent on transit rather than on automobile accessibility until they have a clearer picture of what conditions to anticipate.

- Growth Control - The nation is experiencing a wave of growth control policies: ceilings on residential units permitted in a community, population limitations, freezes on residential zoning, moratoria on sewer hookups and building, and subdivisions to thwart high-density development. According to the U.S. Department of Housing and Urban Renewal, 226 cities are imposing some form of growth control.[1] For example, developers are being forced out of 30 communities in New Jersey's Passaic basin and 40 communities in Florida (one of the fastest growing states in the country). Moreover, in Ohio and Illinois alone 160 cities have sewer moratoria.

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[1] "The Housing Slump Cripples Even the Giants," op. cit.

- Federal Funding - The U.S. Department of Housing and Urban Development, which has backed numerous new community and downtown renewal projects in the past, has limited grant monies. Furthermore, the Federal government has in effect put a moratorium on low-income housing by denying subsidies. Without Federal backing, many large-scale urban projects cannot be implemented in a favorable economic climate, let alone during a tight money period. The costs and the risks are too high for the private development industry to undertake on its own.

As a result of these forces, a number of real estate development companies have recently gone out of business. The smaller developer without equity backup has been particularly vulnerable. One developer cited a 40 percent erosion among people currently in the field, with the remaining 60 percent operating at reduced scales.[2]

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[1] "National Policy Debate Spurred by Cities' Efforts to Limit Growth," New York Times, 30 July 1974, p. 10.

[2] "1974--'Great Year of the Shake-Out' for Developers," The Boston Globe, 2 June 1974, p. A-47.

The impact of current economic problems on the three types of development focused on in this study--shopping centers, office buildings and parks, and mixed-use projects--has been uneven. The residential building industry has been the hardest hit, followed by office construction. Both residential and office development projects are literally stymied in some areas of the country. Retail business, however, is still growing, but at a slower pace than in prior years.

The housing industry (which is related to mixed-use development such as new towns and urban renewal projects) is faced with a curious dilemma. Market economics support a housing boom:

> . . . There is tremendous pent-up demand for housing. People between 30 and 40 years old are the ones who form the most families and would like to buy the most homes. Swollen by the baby boom that followed World War II, this segment of the nation's population is expanding by five million people during this decade.
>
> Housing economists have been saying for years that this demand will take an average of 2.5 million housing starts a year to satisfy.[1]

Mortgage money, although available, is priced too high for prospective homebuyers. As a result, the housing industry is carrying unsold inventory.[2]

The office development industry is also facing some difficult problems. New York City, which has traditionally been a center for enormous building activity, experienced a 20 percent decline in the dollar volume of office construction projects during the first five months of 1974 whem compared with the same period a year ago.[3] New York City is overbuilt with 30 million square feet of excess office space. Construction is also lagging in Boston and on the West Coast. Boom areas in Texas and much of the South are said to have already reached their peak construction volumes. It is projected that New York, Houston, Chicago, and Los Angeles have a sufficient office supply to satisfy the market for the next three to five years.

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[1] "The Housing Slump Cripples Even the Giants," op. cit., p. 4.

[2] Ibid., p. 1.

[3] "Worst Slump Since '50's Hits City Building Trade," The New York Times, 28 July 1974, p. 1.

Shopping center developers (at least the larger ones) are weathering the storm more successfully than their housing and office counterparts since, even during inflationary periods, the public will frequent the department store, but with a tighter grip on the pocketbook. Encouraged by the major department stores, the shopping center developer is still actively engaged in searching for sites. The current problem for him in many instances is the competition. Who will get the anchor tenant's commitment? This competition in a climate of escalating costs and falling profits is using up liquidity at a time when the industry needs a cushion. Thus, only the larger established operations with substantial credit lines can afford to keep in the running.

Within this context, it is understandable that developers are very uncertain as to how they will react to ISR and how the regulation will ultimately impact on their developments. For the purpose of this study, the costs that developers may incur as a result of ISR have been divided into three broad categories:

- Application costs.
- Time-related costs.
- Design change costs.

Various items which may fall under each category are listed in Exhibit III-1.

EXHIBIT III-1
POSSIBLE DEVELOPER COSTS AND CHANGES IN DEVELOPMENT PROCESS ASSOCIATED WITH ISR[1]

- Application Costs

  --Earlier development of complete plot plan and architectural details.
  --More extensive study of topography and meteorological conditions.
  --Traffic analysis.
  --Monitoring.
  --Air quality analysis using Technical Guidelines and/or diffusion modeling.
  --Appearances at hearings.
  --Results modification.

- Time-Related Costs

  --Processing time.
  --Need to follow up to induce action toward decision.
  --Carrying costs.
  --Land options.
  --Taxes.
  --Reallocation of project priorities.
    -Adjusting work effort and flow.
  --Adjustments to time schedule.
    -Danger of loss of lead tenant.
    -Contingencies by lenders and tenants dependent on regulations and delay.
  --Slowdown of processing projects within developer's office.
    -Employment consequences.
    -Cost increase in relation to efficiency.
    -Profit/loss influence.
  --Litigation and appeals.

- Costs of Implementing Design Changes (if necessary)

  --Land costs.
  --Design change costs.
  --Negotiation with local, county, and state highway personnel on incidence of design change costs (including preparation of highway EIS, if needed).
  --Construction cost increases.
    -From delay.
    -From phasing.

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[1] The incidence of specific costs will vary according to the nature and timing of a particular facility.

B. Approach and Assumptions

An indirect source review was performed for each of the six case studies described in Section C. Based on the results of the air quality analysis, least cost design changes were proposed for developments which caused any violations of NAAQS for CO. In determining the design changes, attention was given to potential improvements of the traffic network and to mass transit and other volume decreasing alternatives (e.g., staggered workhours and carpooling). The costs of the design changes and the other expenses incurred by the developer as a result of the review were added to each development's financial statements in order to assess the economic impact of ISR on the development.

The economic impact of ISR in the case study developments was assessed first with respect to a go versus no-go decision on the part of the developer. Then, in order to obtain a comparison among the cases, the financial feasibility criteria were run through for each case--both with and without ISR.

Because of the number of cost assumptions that were made in the case study financial analysis, a sensitivity analysis using a variety of alternative cost assumptions was undertaken. The analysis (presented in Section D) isolates and describes the differential impacts of the major cost parameters related to ISR.

Finally, in order to supplement the economic impact analysis, cost impacts experienced in areas currently implementing review regulations were compared with the case study projections (Section E).

1. Air Quality Analysis

The air quality analysis was performed entirely by using the U.S. EPA Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality. Computer modeling methodologies were not used in the analysis. In addition, monitoring to obtain background CO concentrations was not undertaken in any of the case studies. Instead, background levels were obtained from local and state offices of air quality control and consultants who had conducted environmental analyses for particular projects among the six cases.

The impact of roadways or exits/entrances on CO concentrations at a nearby receptor were estimated by adding the impacts of individual traffic lanes at a reasonable receptor site. Receptors were selected based upon the following Guidelines' definition:

> Reasonable receptor sites are those locations where a person or persons might reasonably be exposed for time periods consistent with the National Ambient Air Quality Standards for carbon monoxide. (p. 39)

Zoning maps, aerial and street-level photographs, on-site surveys and, in some cases, land use plans were used to determine areas where a person might be exposed to concentrations for periods of one hour, eight hours, or both.

Relatively conservative assumptions were used in placing receptors close to the source--the roadway or exit entrance. For example, if a land use plan called for an area to be converted to residential use but specific site plans were not available to determine the set-back distances, the receptor was placed at a distance of 10 meters from the nearest upwind traffic lane. This procedure is in accordance with EPA/OAP practice.

All roadways and exits/entrances within a quarter of a mile of the case study site were examined for impact on receptors. Maps, traffic reports, and other sources were also examined for evidence of relatively significant impact on receptors outside of the quarter of a mile area. Where appropriate and where information was available, concentrations at the more remote receptor sites were calculated--although the costs of any design changes needed to correct conditions outside the quarter of a mile limit were not included in the economic impact analysis.

Determination of wind direction was based on reasonable (in terms of the area's meteorological conditions) and worst case (in light of sensitive receptor location) criteria. As mentioned, each road was modeled according to the Guidelines on a lane-by-lane basis. In cases of multilane highways estimates for distances beyond the 50 meters shown in the Guideline, graphs were made on a proportional basis. The impact on receptors located within the indirect source was calculated according to the area source concentration methodology described in Appendix H of the Guidelines.

Where, based on the calculations, violations were found to occur at reasonable receptors, the least cost design changes were recommended. The bases used to estimate the costs and effectiveness of the design changes are included in Appendix F. The assumed opening date and therefore the assumed automobile mix was 1975. Potential violations of national standards were also examined for the automobile mixes for three future years in the sensitivity analysis in Section D.

2. Economic Impact Analysis

a. **Financial Feasibility Criteria.** The methodology used to assess the economic impact of ISR on the three types of development is comprised of guidelines concerning how several key financial feasibility criteria should appear. The criteria are described below:

(1) Minimum of "Front-End" Money

Front-end money is that sum spent by a developer from his own funds prior to undertaking a project. It also includes that money spent to determine whether a project should be undertaken. Such funds are totally irrecoverable if the project does not proceed, but are usually recoverable within six months to two years (depending on the size and complexity of the project) if the project is undertaken. Front-end money represents the "cutting edge" of the developer's resources since it is literally that portion of resources invested to generate additional resources to keep the developer in business. Understandably, then, front-end money is very "expensive" and is spent only when the developer's professional experience and his intuition suggest that the odds favor the ultimate feasibility of a project.

Front-end costs could include options or leases to control the land until feasibility is determined, marketability studies, soil borings to determine foundation costs, and title searches/examinations to make sure that a clear, unencumbered title can be obtained. Obviously, the amount of front-end money expended would depend on (i) how complex and time-consuming a project is likely to be; (ii) how "tight" the developer's total supply of front-end money happens to be (larger developers could obviously undertake larger and longer process projects); and (iii) how willing the developer is to trust his experience and intuition. Understandably, then, there is no single rule for determining what is the appropriate front-end money commitment for most projects and most developers.

(2) Little or No Permanent Developer's Investment and Maximum Capitalized Value Over Project Cost

Front-end money also represents an important part of the developer's investment in a project. The remainder of his investment in a project, comprised of further studies and land acquisition, is contingent on the project's moving forward.

The developer's investment (front-end plus other developer expenses) is too precious, for the reasons cited above, to form a permanent part of the long-term financing that supports the mortgageable/marketable life of a project. Consequently, institutional or substantial private lenders are called upon to provide the necessary funds for this long-term financing support. In exchange for this, lenders require a sufficient rate of interest on the loan. It is this mortgage, defined by the use of other people's money, that helps to create a developer's value. Once this money replaces the developer's investment, he is mortgaged out, although he still owns the project. Thus, it is important for the developer to mortgage out as early as possible so that his investment is recovered for use in other projects and is not tied up in permanent commitments.

The feasibility of a project is determined in part by the speed with which a developer is likely to recover his investment and whether he can replace all of it with other permanent financing commitments. The degree of "spread" or excess of the capitalized value of a project over its cost is also an indicator.

Once a project has been successfully financed, built, and tenanted, the developer can either keep the project to obtain the annual net cash flow or he can sell it. If he chooses to sell the project, he can sell it as a single piece or he can "syndicate" the sale by forming shares in the project. Syndication increases the number of potentially interested buyers and usually results in the developer's being able to secure a better sale price. In this sense, the effects of syndication are similar to the effects of stock splitting on a security exchange. There are certainly more people who are potentially interested in investing $50,000 in real estate than there are in investing $2 million.

Through syndication the developer can also make "shares" much more valuable than their cost. Specifically, he can structure the shares so that one group is comprised of 85 percent of the net cash flow and 15 percent of the depreciation, while another group might be comprised of a substantial share of depreciation and almost no cash flow.

Projected profit from outright sale or syndication is treated as present worth of the value added or it is treated as capitalized value over project cost. It is not a general part of project financing. Consequently, if initial investigations suggest a significant long-term requirement of the developer's investment (because institutional commitments are unlikely to mortgage out the developer in the project), the project would probably be considered to be economically unfeasible.

(3) Minimization of Cash-Out Before Cash-In vs. Project Timing

Once a project is committed, the extent of cash-out (borrowed) before cash-in is an important consideration. However, it is not as critical as whether the development is proceeding as fast as possible. For instance, it might be better for a developer to spend money for plans, studies, and so forth, in advance of funding schedules if this would allow him to start construction earlier in order to take advantage of the weather, present construction costs, union contracts still in force, materials availability, and the like. For example, construction loans are currently running at 12 to 15 percent interest per year. Saving three months by pouring concrete prior to the winter or reducing time by using materials presently obtainable could save the developer substantial loan costs. Such actions could also reduce construction costs because they would minimize the developer's exposure to inflation.

(4) Maximum Return on Developer's Investment

Even though the developer's investment might not be involved in a project for long, an attractive rate of return for the period in which it is involved is sought by the developer. This is understandable in view of the importance, value, and power of the developer's front-end money. There are no fixed criteria, but this rate of return is not likely to be less than 12 to 15 percent. Depending on both the risks involved and the expertise of the developer, the return on his investment could be as high as 25 to 30 percent. Return on his investment is usually more important than return on total investment because the money that matters to the developer is his own. The rest of the investment is money that he "rents from someone else.

(5) Maximum Net Yield on Total Investment

Again there are no fixed rules. Generally, developers attempt to maximize net yield on total investment which is a summary ratio that involves a few simple component concepts. One concept is "program cost," a compilation of all costs for developing but not necessarily for operating or maintaining a project. An itemization of program cost is included in Exhibit III-2.

Another concept is "net cash flow," which is simply the excess of rental revenues over both debt service (interest and amortization, and the long-term capital cost of development) and operating costs (insurance; security; maintenance; repairs; possibly heat, light, and air conditioning; taxes; brokerage fees; legal, accounting, management, and miscellaneous fees). For example, if a project's gross revenues are $300,000 and it has a debt service cost of $130,000 and an operating expense of $70,000:

$$\$300,000 - (\$130,000 + \$70,000) = \$100,000$$

then the net cash flow would be $100,000.

EXHIBIT III-2

SUMMARY OF ESTIMATED PROGRAM COST

Site Area:
Buildings: (square feet)
Parking:
LAND: (cost)
DEMOLITION
SURVEYS, TOPO, BORINGS:
SITE PREP. (Fill, Grading, Etc.)
UTILITIES: (Water, Sewer, Septic, Drains, Etc.)

BUILDINGS: (Attach Schedule)
Major Stores:
Miscellaneous Stores:
Offices:
Free Standing Units:
Mall Areas:

SITE IMPROVEMENTS:
(Paving, Lighting, Striping, Sidewalks, Curb)
Landscaping:
Fencing:
Pylons - Signs, Etc.

ARCHITECTURAL & ENGINEERING FEES:

INTERIM EXPENSES:
Legal: (Titles, Contracts, Financing, Leases)
Real Estate Taxes: (During Construction)
Insurance:
Advertising-Publicity-Sales Promotion)
Commissions: (Leases, Etc.)

FINANCING:
Bank Service Charges
Interest on Construction Loan:

Mortgage Brokerage Fees: Construction:
Permanent:
Permanent Mortgage Commitment Fee:
Title Insurance:

DEVELOPMENT FEE:
ACCOUNTING - PERMITS - MISCELLANEOUS

TOTAL PROGRAM COST:

The third concept involved in net yield on total investment is the "financing constant" or "mortgage constant." This is the ratio of the annual debt service to the size of the loan. A few examples should suffice to illustrate that the longer the term of the loan, the lower the financing constant.

If a loan is obtained for one year at an interest rate of 12 percent and is payable monthly, the financing constant is equal to 106.6 percent. If the loan is payable in two years, the borrower must pay 56.5 percent of the loan each year. Given a 10-year period to pay back the loan, interest and amortization would total 17.2 percent, or $172,165 annually. For a 20-year term, the constant would drop to 13.22 percent, and for a 30-year term, to 12.34 percent. (Annual debt payments are quickly derived from standard mortgage or compounding tables which list monthly amounts to be paid on the principal and interest on the unpaid balance of the principal.)

The financing constant, net cash flow, and program cost are all important to the measure of net yield on total investment which is determined by dividing net cash flow by program cost and finding the excess that the quotient represents over the financing constant. For example, one rule of thumb sometimes used is to look for an excess of 1 1/2 percentage points for every year that a project takes to be built. This rule is based on the premise that the longer a project takes and the more complicated it is, the more risk it involves. This is entirely consistent with the previous discussion on the critical importance of the developer's investment. The longer the developer is involved in getting a project built the longer his investment is at risk and the more he must seek a reward commensurate with this risk. In short, what all of this represents is a type of risk/reward ratio for the developer.

(6) Cash Flow per Net Leasable Square Foot

This indicator is often used by developers to assess the feasibility of a project. As a rule of thumb, developers look for $1.00 per square foot in office parks and $2.00 per square foot of small tenant space in shopping centers.[1]

This index, like other ones, could be misleading. Different financing arrangements could distort its meaning. For example, a developer, by overfinancing a project, could show a cash flow per square foot which underestimates his actual return.

Project characteristics could also cause this indicator to give an inaccurate reading of the financial situation. In a shopping center which has an unusually low quantity of small tenant floor area, $2.00 per square foot could represent an inadequate cash flow in view of the financial exposure required of the developer to build the center. Consequently, despite wide use of the ratio in the development industry, the standards of $1.00 for office parks and $2.00 for shopping centers are not always met.

(7) Internal Profit/Overhead Considerations

One criterion frequently cited is the extent to which a project offers to maintain a respectable profit (at 8 to 18 percent) for the developer's personnel overhead. This criterion is certainly neither a necessary nor a sufficient one for a developer to proceed with a project. However, in some cases it might be a contributory factor once it has been determined that a project offers minimally requisite credentials. For example, a residential developer who has a full-time complement of professional staff might undertake otherwise marginal (lower payoff) projects in order to support and retain valuable people. Likewise, a development corporation which holds a large non-revenue-producing asset such as raw land might attempt to dispose of this asset through development or to simply "put the land to work."

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[1] These figures were cited by developers participating in the six case study analyses and have been verified by major representatives of the lending community such as Connecticut General Insurance Corporation.

(8) Tax Shelter

Tax shelter can be one reason for a party to be attracted to syndication [see the discussion under Section B2a(2), above]. However, in that situation the developer is "taken out" of a project by a high tax bracket investor or corporation. While development corporations frequently do have a substantial amount of shelter in their projects, tax shelter today is simply not the guiding raison d'etre for development. In fact, in most cases it plays a minor role in the determination of project feasibility by the developer.

* * * * *

In summary, developers frequently say that in order for a project to be feasible it must "stand on its own." Generally, this means that:

- The project, once built, will be marketable and will return a sufficient net cash flow.
- The project will provide the developer with a good return on his investment.
- The project is financeable and the developer can be mortgaged out so that his investment comprises a minimum of the permanent financing.
- The project can be built expeditiously.
- A minimum of front-end money is required.

b. Cost Assumptions. Various cost and timing assumptions were required in order to analyze the six case studies presented in Section C. These assumptions are described below:

(1) Data Acquisition and ISR Application Preparation Costs

The ISR preparation and application costs were assumed to equal $45,000, broken down as follows:

	Approximate Cost
Data acquisition (historic meteorological data, topographic information, land use plans, etc.)	$ 500.00
Extra traffic engineering studies (volume demand-to-capacity ratios, lane by lane, for all principle roads, intersections, and access points within a quarter of a mile of the indirect source; traffic flow projections for one year after full operation of the facility)[1]	7,000.00
Monitoring (assuming CO measurements made with non-dispersive infrared device; simultaneous meteorological and traffic count recording; four receptor sites)	18,000.00
Computer modeling (Gaussian plume dispersion model)	8,000.00
Legal review	3,500.00
Evaluation of design changes (if potential CO violation is found)	--[2]

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[1] Conventional traffic engineering studies generally do not supply all the data needed for an air quality analysis (e.g., lane-by-lane data). This topic is discussed more fully under Part V of the report.

[2] For the purpose of this analysis, no cost was assumed for in-house evaluation of design changes needed, prior to finalizing air quality impact projections and submitting an ISR application. It is highly probable, however, that many developers, after gaining some experience with ISR, will elect to assume certain costs for this type of evaluation in order to reduce some of the uncertainty and delay which may be associated with the review process.

	Approximate Cost
• Application completion (formalizing site plans, preparing the application, meetings with review officials, etc.)	$ 2,000.00
• Response to public comments and/or participation in hearings	1,500.00
• Appeals process (if necessary)	--[1]
	$ 45,000.00

When an evaluation of a particular case made it apparent that some of the costs included in arriving at the $45,000 figure had been absorbed by the developer as part of his normal procedures or in response to other government regulations, appropriate reductions were made in the projected cost. No upward adjustment in the application cost was made, however, to take into account monitoring at more than four receptor sites, because this was not required in the regulations although monitoring at more than four sites would be desireable for a truly accurate assessment of potential CO violations. The decision not to increase the application costs was made to keep the assumptions within the most likely range and to offset any overestimation in costs for legal review, meetings with review officials, and other activities related to the review process.

For some of the six case studies, less expensive application costs based on the assumptions of the use of the Technical Guidelines rather than computer modeling and of monitoring data being supplied by a public agency are presented in Section D, Sensitivity Analysis.

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[1] For the purpose of this study, appeal hearings were not assumed to be necessary.

(2) Design Change Costs

Two types of design changes were examined to determine the least cost alternative for the developer: capacity increasing design changes, generally involving roadway modifications, and volume decreasing design changes, encompassing transit options as well as alternatives like work schedule changes and carpooling. The major assumptions used in determining highway and transit design change costs are described in some detail in Appendix F. In addition to the basic capital construction, operating and maintenance costs, the following assumptions were used in determining total design change costs:

- No special engineering problems would be encountered.[1]
- Land acquisition costs where additional rights of way were required would cost no more on an area-wide basis than the price paid for the original site.
- Relocation costs would not be involved.
- The effectiveness of each design change could be ascertained with relative certainty.

In addition, design changes were assumed to be carried out within the normal construction period. However, major changes which involve public participation and funding might actually take substantial periods of time to implement. Some state DOT's estimated that a minimum of three to five years would probably be necessary to institute a major road improvement, while the period of construction for the developments considered in this analysis ranges from one to five years. Therefore, added delay costs could be incurred or a project stopped altogether due to an ISR permit condition that a particular design change be effective one year after full operation or because many lending institutions have stated that they would not finalize a loan until a design change involving public participation is under construction or is in place.

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[1] Engineering problems such as poor subsoil conditions or the need to relocate utilities might easily double or triple the costs of a design change.

A sensitivity analysis is presented in Section D on the costs of establishing a developer financed mass transit operation on a temporary basis to service a facility during the period between start of operation and completion of the permanent design change (either highway or transit). Such a temporary measure would enable the project to meet permit conditions and should eliminate any difficulties with financial institutions in terms of providing funds prior to the completion of a permanent design change.

Design change capital and operating costs in the analysis were assumed to be borne solely by the developer. In reality, the public might help to absorb some of these costs. The sensitivity analysis in Section D indicates how changes in the incidence of cost might change the economic impact of the regulations. Design changes are also based on the 1975 national mix of automobile emissions. A sensitivity test for design change costs for the cases assuming 1980, 1985, and 1990 emissions is presented in Section D.

(3) Time-Related Costs

Assumptions made which relate to the cost of time include the following:

- Time

  The period of time between the submission of an application and the issuance of a permit was assumed to be 90 days pursuant to Federal ISR procedures. Federal regulations allow 30 day extensions at various points in the process which may result in a maximum review period of 180 days. Section D contains a sensitivity analysis of the impact of increased delay factors on developer costs.

- Inflation

  It was assumed that the entire period of time for ISR permit application and approval caused a comparable delay in construction scheduling. The reason for this assumption is the long-planning horizon involved with facilities of a size which triggers ISR. For example, the planning periods for the six case studies described in Section C range from one to five years. The majority of developments that will be seeking ISR after 1 January 1975 in order to begin construction over the next few years will have already gone through PERT scheduling or other forms of time and money allocation. Due to the long-range planning, developers will lack some of the flexibility needed to properly plan for ISR as a time-related element. This cost assumption is therefore most applicable in the early stage of IRS implementation. After the first year or so where projects could schedule ISR in tandem with other pre-construction permit requirements, delays could probably be avoided altogether. The time delay cost function used in the case study analyses equals the projected inflationary increase in construction costs over the next two years, or a rate of one percent per month.[1] No delay time was attributed to monitoring or modeling activities. It was also assumed that developer has some degree of flexibility in timing so that construction crews would not be sitting idle at a site waiting for an IRS application approval--a costly situation which was found to have occurred in a couple of instances in the state and local experience studies.

Section D, the sensitivity analysis, presents variations in the cost assumptions including an assumed rate of 6% per year inflation, a zero time delay and 180 day maximum delay allowed under the Federal ISR.

Interest Rates

Interest rates were assumed to remain constant despite any delays due to ISR based on forecasts that interest rates will drop slightly and then level off over the next two years.

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[1] Engineering News-Record, CXCII, no . 13, 19 September 1974, pp. 65, 201.

C. Case Study Findings

For each of the six case study analyses, a determination was made of the impact of indirect source regulations on a developer's financial position. The determinations were based on the following types of costs:

(i) Cost of data acquisition and application preparation.
(ii) Time-related costs.
(iii) Costs of physical design changes.

The assumptions used in measuring each of the three types of costs have already been discussed.

Each case is presented below with the discussion broken down as follows:

- General description.
- Development process.
- Air quality findings.
- Cost analysis.

The general description provides some insight into the nature and scale of a specific project. This is followed by a step-by-step breakdown of the project's planning stages prior to construction. The timing of various pre-construction activities would have some bearing on where ISR was to be superimposed. It was not necessarily assumed that ISR would fall at the conclusion of any traffic analysis. In certain cases, the developer would undoubtedly have contracted a traffic study earlier if ISR had been required. The air quality findings identify the necessary design changes if any are required. The impact analysis incorporates all of the ISR-related costs into the developer's financial statements.

Two financial statements are shown for each case. The project cost sheet illustrates the breakdown of each project's total capital investment costs with and without ISR. A second statement, the pro forma cash flow, has been developed for each case, with and without ISR, based on the developer's projection of income received and expenses incurred one year after realization of a positive cash flow.

The project descriptions cover the base case assumptions and then draw from the results of the sensitivity analyses. The assumptions used for the sensitivity analysis are desribed in Section D, following the case study descriptions.

1. Project A

a. General Description. Project A is an office park which is located in a rural area of the country that is rapidly suburbanizing. Development from the time of its original conception to the completion of construction spanned a 10-year period. More than one million square feet of gross leasable area are incorporated into the development.

At the time options were taken on the first 50-acre land parcel, the property was undeveloped, open space. However, there were office uses immediately adjacent to the site and on the opposite side of a major interstate highway which bounds the project.

The developer of Project A considered four sites in the general metropolitan vicinity for an office park. Each was in a suburban location with relatively reasonable land costs. The developer ultimately selected his site for the following reasons:

- It had the best highway access.
- It lay directly in the path of growth emanating from the metropolitan core.
- The land itself had interesting topographical features.
- There were already viable office uses near the site.

Aside from the above locational factors, the developer was operating under certain broad feasibility criteria. He also drew from some prior although limited experience in office park development. Aside from profit considerations, he had two major objectives: to minimize his front-end costs and to avoid institutional uncertainties. A zoning change was manageable since he would be protected through land options.

The developer of Project A would be considered relatively small scale. He has minimal liquidity, and he finances as little as possible out of his own pocket prior to obtaining an interim or permanent financing commitment. He performed no market analyses or traffic studies on Project A.

The developer uses his real estate track record to convince lending institutions to grant him loans. Often his buildings are not tenanted when he lines up permanent financing; in Project A, however, every office building was fully tenanted before the completion of construction.

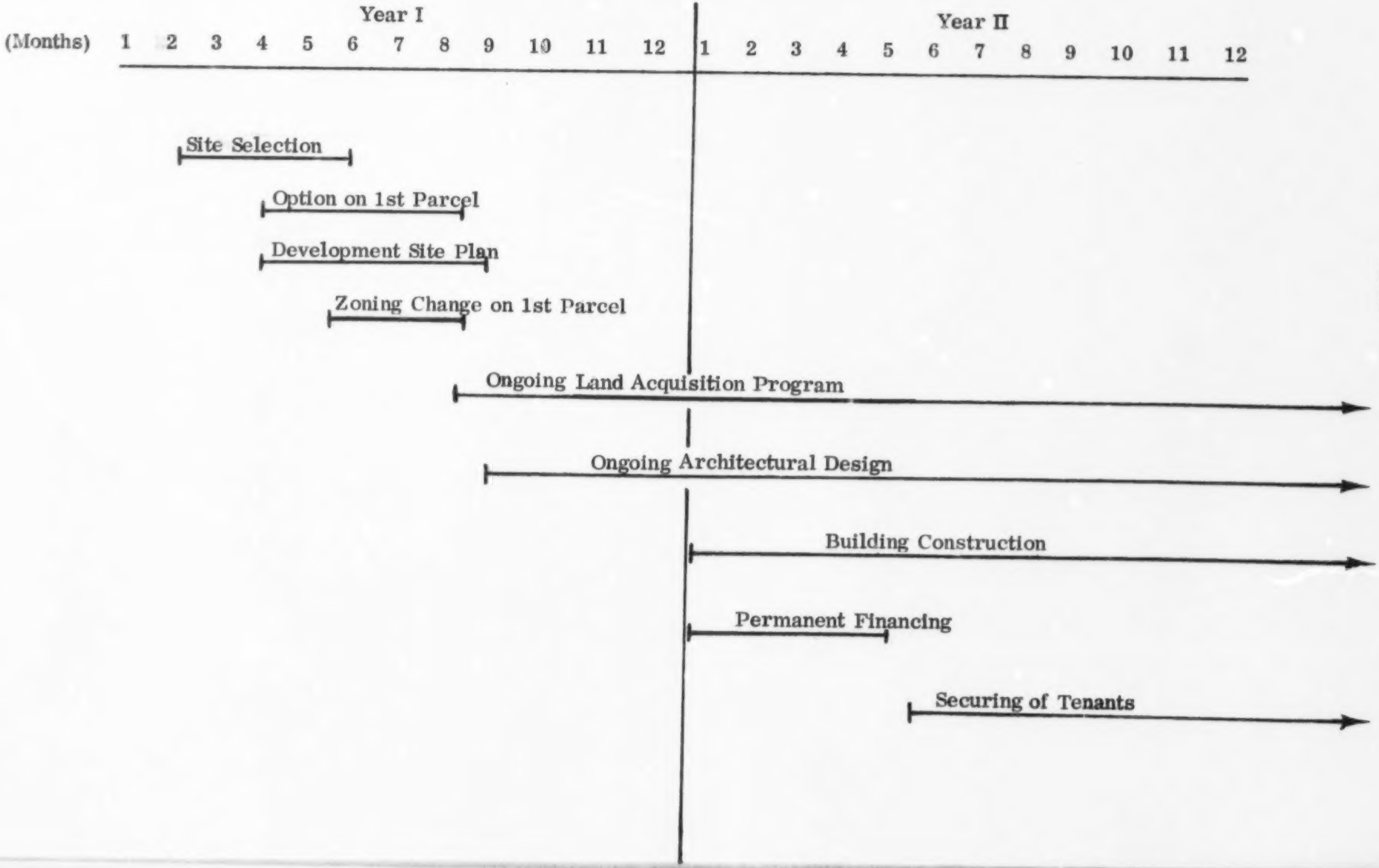
This developer owes some of his success to aesthetic sensitivity. He spends relatively large sums of money on site improvements and landscaping. Project A is 40 percent greenbelt. These amenities are paid for out of loan commitments.

Project A was subject to a zoning code for parking. One space had to be provided for every 300 square feet of gross leasable area. The on-site parking is more than adequate. Transit patronage by office park employees is negligible.

b. Development Process. The developer spent four months investigating property that could be developed and taking options on parcels that appeared to be promising for an office park (see Exhibit III-4). Multiple sites for development curtails a developer's risk if one prospect should fall through. The option on Project A was taken in April of Year I. A planner was engaged to prepare a preliminary site plan for a zoning change; negotiations started the following month with the local zoning board. Approval was granted at the end of the summer for the first 50-acre parcel.

The developer purchased the land and commissioned an architect to prepare designs on the first complex of buildings. Ground was broken in January of Year II. Interim financing was used for the initial construction, and three permanent loans were negotiated during the course of the second year, pursuant to a commitment by a major American corporation to occupy the first building.

EXHIBIT III-4
PROJECT A - DEVELOPMENT PROCESS



The developer of Project A limited his front-end investment to preliminary planning consultant fees. He spent his own time investigating possible sites and then applying for a zoning change. These costs totaled about $10,000, or less than one percent of total project costs.[1] The option he obtained on the first parcel was interest free. Indirect source review procedures would have started either concurrently with the application for a zoning change or after it had been granted.

c. Air Quality Findings. Relatively low peak-hour trip generation rates are found at the Project A office park, primarily as a result of the tenant mix. During peak hours, arriving traffic equals 1.34 vehicles per 1,000 square feet while departing vehicles account for less than .1 vehicles per 1,000 square feet.

The road network providing access to the park consists of 2 four-lane arterials, a single six-lane arterial, a four-lane collector road, and an interstate highway with two interchanges serving the vicinity of the development. Traffic does not exhibit any unusual peaking or directional split characteristics.

Exit/entrance gates to the park intersect one of the four-lane arterials and the four-lane collector. Both driveways are two lanes in each direction; driveway traffic has the right of way over other vehicles. Use of the two opposing gates is split equally.

A ring road, with development on either side, provides internal access. Each building or group of buildings has its own parking area. There are a total of more than 4,000 spaces in the park.

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[1] See Exhibit III-6.

The EPA method for assessing air quality indicated that the park and the area within a quarter of a mile of it were not in violation of either the one- or the eight-hour standard. Air quality at both interchanges, one outside the quarter-mile area, was assessed and found to be in compliance (see Exhibit III-5).

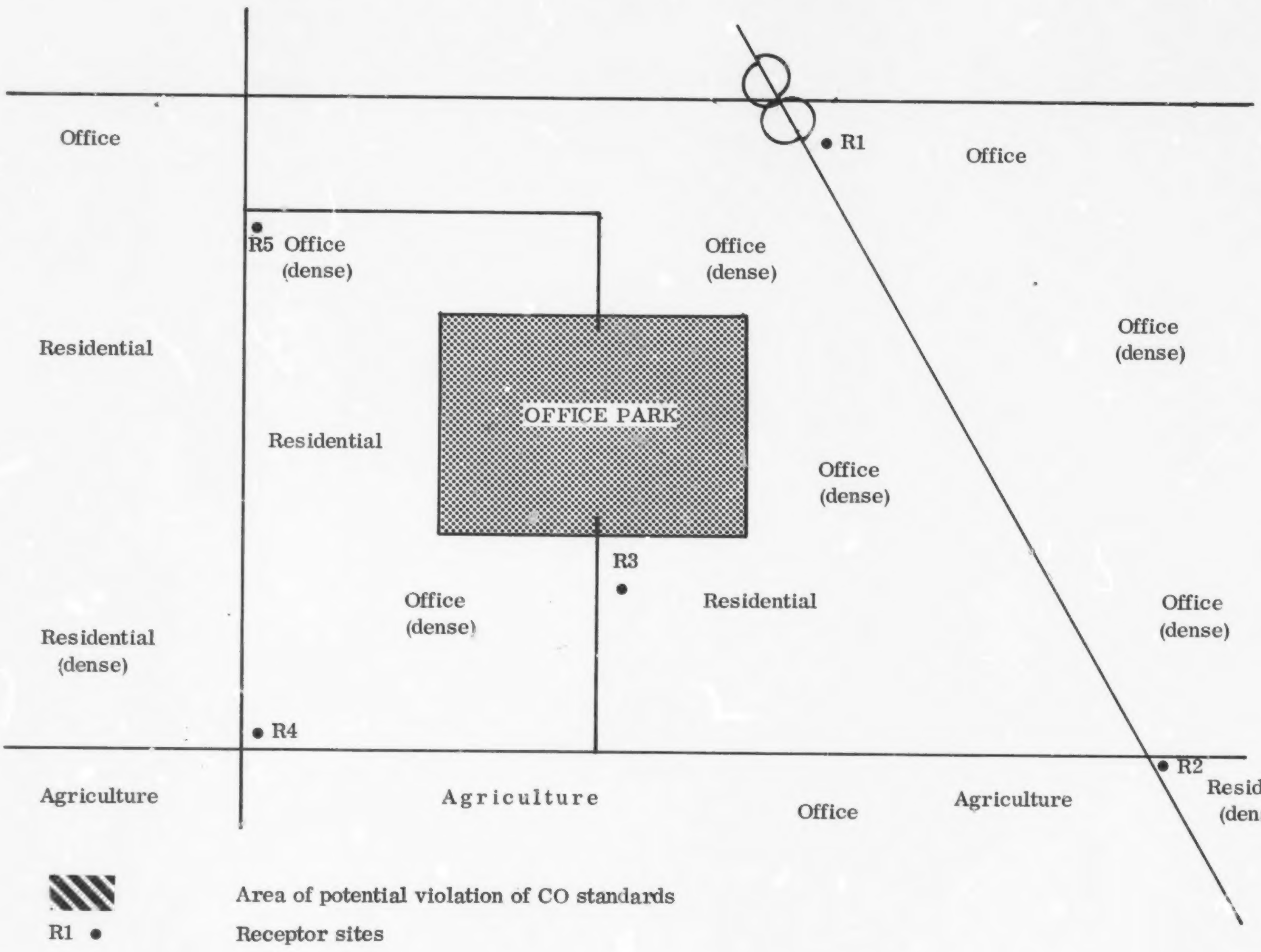
One section of the interstate highway, about a mile from the site, was found to exceed both the one- and the eight-hour standards. Because this violation was located outside the bounds of ISR, design changes were not estimated. While a reviewer, has the authority to exercise his discretion in determining whether a developer should be penalized for air quality violations beyond the quarter-mile periphery, this was far enough away and of such little casual relationship to the development that it probably would not have been cited as a violation.

The fact that this facility meets standards results from a combination of the surrounding roadnet and the travel patterns generated by surrounding development. The area where the park is located is considered a high-growth area by the state transportation department. The interstate highway bisects this area. The side where the site is located is largely residential. Much of the impact of other non-residential development on the site roadnet is absorbed by the interstate. Residents in the vicinity, for the most part, use the interstate ring road which is only a few miles away.

In summary, the major impact on the roads surrounding the site (excluding the interstate) results from the office park. As indicated previously, the park has low peak-hour generation and well-developed driveways and access roads. Under these conditions traffic flows smoothly and air quality is maintained at acceptable levels during peak-hour traffic.

d. Cost Analysis. Indirect source review would enter the development process in early fall of Year I. It would be triggered by plans to build a complex of buildings encompassing more than 300,000 square feet with associated parking of more than 1,000 spaces. Because no design changes are

EXHIBIT III-5
PROJECT A - SCHEMATIC LAND USE PLAN


Office
R1
Office
R5 Office
(dense)
Office
(dense)
Office
(dense)
Residential
OFFICE PARK
Residential
Office
(dense)
R3
Office
(dense)
Residential
Office
(dense)
Residential
(dense)
R4
R2
Residential
(dense)
Agriculture
Agriculture
Office
Agriculture
Area of potential violation of CO standards
R1
Receptor sites

required in Project A, the review costs would most likely range from $45,000 for preparation, approximately $260,000 in construction delay, and the additional carrying cost and debt service of these expenses to $3,000 for application costs and no construction delay.

As shown in the financial summaries with and without the hypothetical review (Exhibits III-6 and III-7), total project costs could be increased by $324,222 ($31,749,222 - $31,425,000), and pre-tax cash flow could be reduced by $31,611 ($734,062 - $702,451), representing less than one percent of gross income. Over the long term, these increased costs and decreased returns would have little impact on the feasibility of the development.

The spread between the capitalized value of the project and the actual project cost would be reduced from $7.5 million to $7.2 million. This excess value would be created by the developer and would be a good indication of the project's financial success; the reduction would be minimal.

Another indication of the financial feasibility would be the percentage of cash on cash return. This is expressed as follows:

$$\text{Cash on Cash Return} = \frac{\text{Cash Available for Debt Service}}{\text{Project Cost}}$$

Project A has a cash on cash return of 12.1 percent without ISR and 12.0 percent with ISR. As a rule of thumb, developers look for a figure of 10 percent or more.

The developer in this project has overfinanced, a common and accepted strategy. Portions of profit and overhead expenses are included in the costs presented in Exhibit III-6. In essence, the developer would receive at least part of his return when financing takes place.

The pre-tax cash flow per net leasable square foot is $0.82 without ISR. The 5 percent reduction of $.04 per square foot to $.78 with ISR might disappoint the developer but still would not jeopardize the financial feasibility of the project.

EXHIBIT III-6
PROJECT A - COST SHEET

	Without ISR		With ISR	
			Computer Modeling and 90-day delay	
Investment Costs				
Land		$ 2,400,000		$ 2,400,000
Construction		22,500,000		22,757,559
Other				
Grading, Utilities, & Site Improvement	$ 1,800,000		$ 1,800,000	
Architectural & Engineering	675,000		675,000	
Legal	90,000		90,000	
Advertising & Promotion	180,000		180,000	
Leasing, Overhead, & Contingency	1,530,000		1,530,000	
Indirect Source Review	--		45,000	
Financing During Construction	2,250,000		2,271,663	
		6,525,000		6,591,663
TOTAL PROJECT COST		$31,425,000		$31,749,222

With ISR Technical Guidelines and No Delay	
	$ 2, 400, 000
	22, 500, 000
$ 1, 800, 000	
675, 000	
90, 000	
180, 000	
1, 530, 000	
3, 000	
2, 250, 215	
	6, 528, 215
	$ 31, 428, 215

EXHIBIT III-7
PROJECT A - OPERATIONAL CASH FLOW

	Without ISR		With ISR Computer Modeling and 90-day delay	
Income				
Rental*		$ 6,525,000		$ 6,525,000
Expense				
Management	$ 650,000		$ 650,000	
Maintenance	1,130,000		1,130,000	
Insurance	400,000		400,000	
Property Taxes	547,000		547,000	
		(2,727,000)		(2,727,000)
Cash Before Debt Service		$ 3,798,000		$ 3,798,000
Debt Service		(3,063,938)		(3,095,519)
Pre-Tax Cash Flow		$ 734,062		$ 702,451
Pre-Tax Cash Flow per Net Square Foot		$0.82		$0.78

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* Includes 5 percent vacancy factor.

With ISR

Technical Guidelines and No Delay

	$ 6, 525, 000
$ 650,000	
1, 130,000	
400,000	
547,000	
	(2,727,000)
	$ 3,798,000
	(3,064,251)
	733,749
	$0.82

In sum, the long-term impact of ISR would not create a financial burden and the project would have gone ahead as planned. In the short run when front-end money is critical, ISR might be a problem, since the developer in this case reduced his front-end costs to the bare minimum. He estimates that prior to the hypothetical review, less than $100,000 had been expended on land options; architectural, engineering, and legal fees; and overhead. In addition to deliberately minimizing his equity involement in the project, the developer moved to regain his front-end funds at the earliest possible date by covering these expenses with the financing obtained (i.e., by mortgaging out).

Costs of $45,000 to prepare for ISR,an increase of 50 percent over front-end expenditures without ISR, would not have been incurred, however, if the developer had decided to test the site first using the Technical Guidelines. It is likely that most developers in planning a project requiring a substantial capital investment will prefer to use a modeling approach from the outset to provide the most accurate base for determining what, if any, design changes will be needed. Nevertheless, in cases such as Project A, which are located in relatively undeveloped and uncongested areas, a developer may indeed decide to initially apply the Technical Guidelines and only proceed with modeling if there is evidence of a potential CO violation. The assumption of this latter approach to an ISR application for Project A has been made as one of a series of sensitivity tests, described in Section D. In this case the application costs have minimal impact and if no delays were incurred in construction, the costs of ISR would be negligible.

2. Project B

a. General Description. Project B is a regional shopping center which has been developed over the course of six years. It contains 630,000 square feet of gross leaseable area and approximately 2100 parking spaces. The facility is located in an urban-type area which is unusual in that it is densely populated with middle-income families. However, the property acquired by the developer was considered blighted prior to development. In a manner characteristic of urban decay, the site was occupied by old gas stations and a honky-tonk amusement park.

The developer's strategy was to coordinate the center with the two major freestanding stores in the area in order to make the facility a hub of retail trade. The market area is basically free of competition; consequently, this development has reduced shoppers' travel time by providing opportunities for concentrated shopping activities. Since the area is subject to the provisions of a transportation control plan and parking management regulations, the potential to reduce vehicle miles traveled (VMT) was a salable feature of the development.

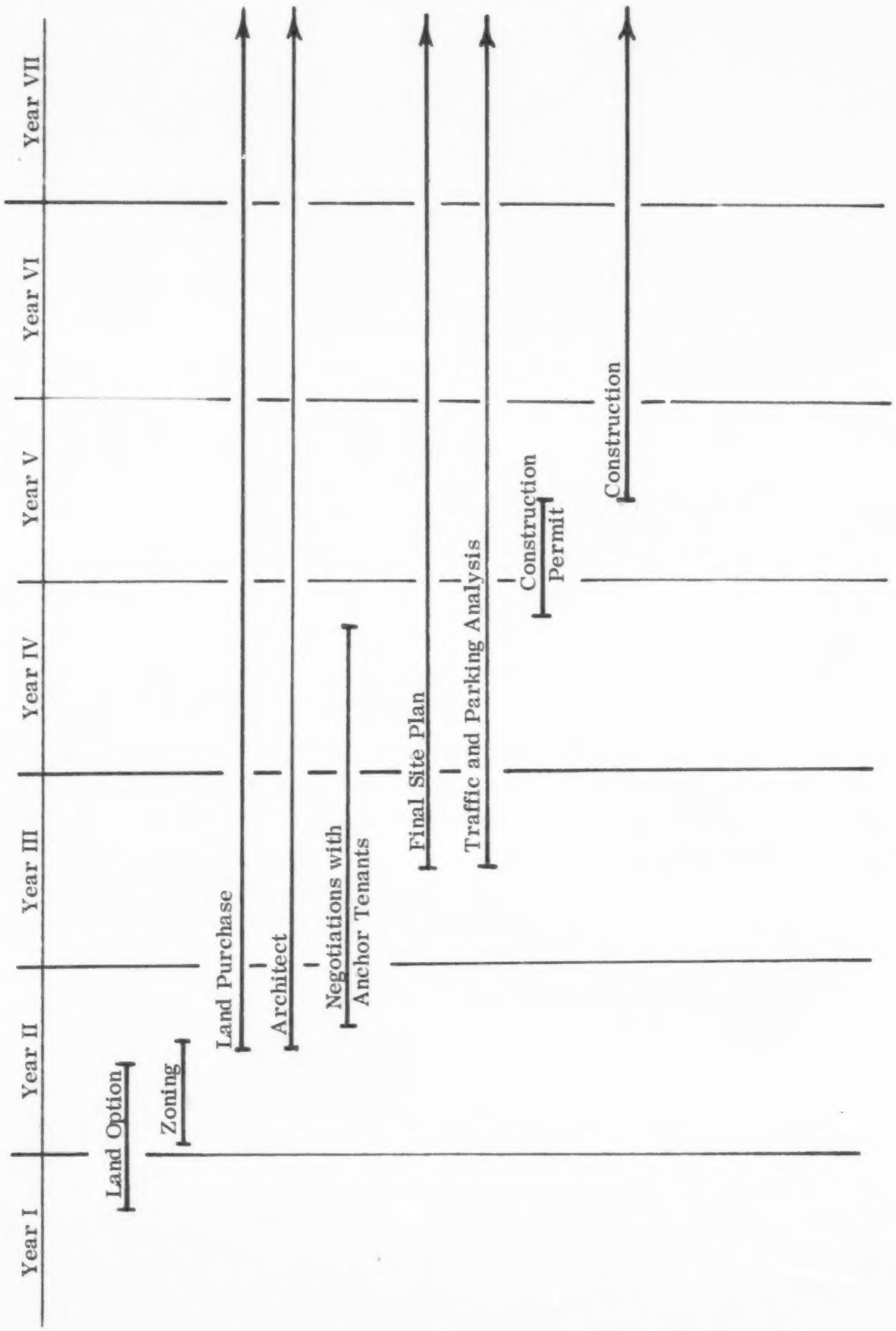
The modal split for the facility is 60 percent automobile and 36 percent transit and four percent walk-in population. Parking spaces at the facility correspond to the number required by city zoning limitations. In addition, a municipal lot adjacent to the center is open at night for overflow parking during peak hours.

b. Development Process. The developer of Project B chose to build a regional-scale shopping center in an urban area. Two of his high priority considerations for site selection were (i) the income of the surrounding population and (ii) the competition within the market area. The preliminary market study, which focused the developer on the project's location, was conducted in-house and represents the only market study undertaken.

Exhibit III-8 outlines the development process from the acquisition of the land option in the fall of Year I to the opening of the facility in the fall of Year VII. Zoning approval was received in the summer of Year II and was followed immediately by the purchase of the land. The developer paid interest and taxes on the land during the period in which he held the option. Negotiations with anchor tenants commenced in the fall of Year II and continued until the fall of Year IV, after the final site plan was established.

EXHIBIT III-8

PROJECT B - DEVELOPMENT PROCESS



Traffic and parking studies were undertaken initially to develop a parking garage design. The analysis continued to encompass more complete traffic planning for the surrounding roadnet. Indirect source review was assumed to enter the development process in Year II, after zoning approval and before the land purchase. With ISR, traffic planning would have been shifted to an earlier period in the development process.

c. Air Quality Findings. Peak-hour trip generation rates at this shopping center represent 2.3 trips per 1,000 square feet inbound and 1.5 trips per 1,000 square feet outbound. Vehicles must approach and depart through a heavily loaded street system.

The site is located adjacent to the crossing of a major six-lane expressway and two major arterials, one eight lanes wide and the other twelve lanes. Two-lane and four-lane roads surround the remainder of the site. Twenty-six percent of the traffic reaches the site by means of the expressway; 29 percent uses the twelve-lane arterial; and 21 percent uses the eight-lane arterial. The directional split on these roads favors the peak direction in conventional proportions.

A six-level parking structure is located at one corner of the site. There is one entrance/exit gate on each road bordering the garage. Use of the two gates averages a 50-50 split during the week. However, on Saturdays, when there is unusually high congestion, traffic favors one gate at a split of 70-30.

Use of the EPA methodology indicated 7 one-hour violations and 2 additional eight-hour violations. Changes in signalization were the first design changes tested.[1] Under optimal signal timing, violations would be reduced to

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[1] One of the least costly design changes which might be applied in this particular case is the use of signs or traffic officers to reassign traffic on Saturday and to more evenly distribute flows between the two gates. The state-of-the-art of traffic engineering, however, does not provide sufficient data to determine the relative impact of traffic officers or signs on proportional reassignments of motor vehicles and consequently, the effect on air quality could not be assessed. Therefore, this option was not included in the design changes tested.

5 one-hour and 2 additional eight-hour problems. The cost of these design changes would be $70,000 to the developer in the absence of public support (see Exhibit III-9).

Two other design changes are recommended: widening three streets bordering the site at a cost of $167,000 and increasing the on/off capability of expressway ramps at a cost of $763,000. These costs only include allowance for the actual construction and materials. Because this area is quite developed, construction of this kind would be much more expensive. An additional $500,000 has been estimated to account for right-of-way taking and the rerouting of traffic during construction.

These design changes are only aimed at not exacerbating existing CO violations with site-generated traffic, so as not to hinder the rate of attaining NAAQS for CO. They do not account for violations caused by through traffic on the expressway and other roads.

d. Cost Analysis. Indirect source review would enter the development process of Project B in Year II either concurrent with or after zoning approval. The increase in project costs with ISR as shown on Exhibit III-10, most likely would range from about $2.6 million to $1.7 million:

•	Delay in construction	$0 – $ 833,300
•	Design changes	1,500,000
•	ISR preparation	35,000
•	Interim financing	$157,000 - 243,000

The impact of construction delay could probably be reduced or eliminated by including ISR in the project's timetable. Design changes, estimated here to cost $1.5 million, could easily run significantly more because of the urban location. Indeed, it is quite possible that the proposed design changes could not be implemented because condemnation of adjacent development for right-of-way taking might not gain approval. The effectiveness of applying mass transit options was doubtful since the project already had a very high transit modal split (see Appendix F).[1]

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[1] The reason that increased transit ridership was not feasible is that for the urban resident population transit ridership levels are high. The location of this facility,

EXHIBIT III-9
PROJECT B - SCHEMATIC LAND USE PLAN

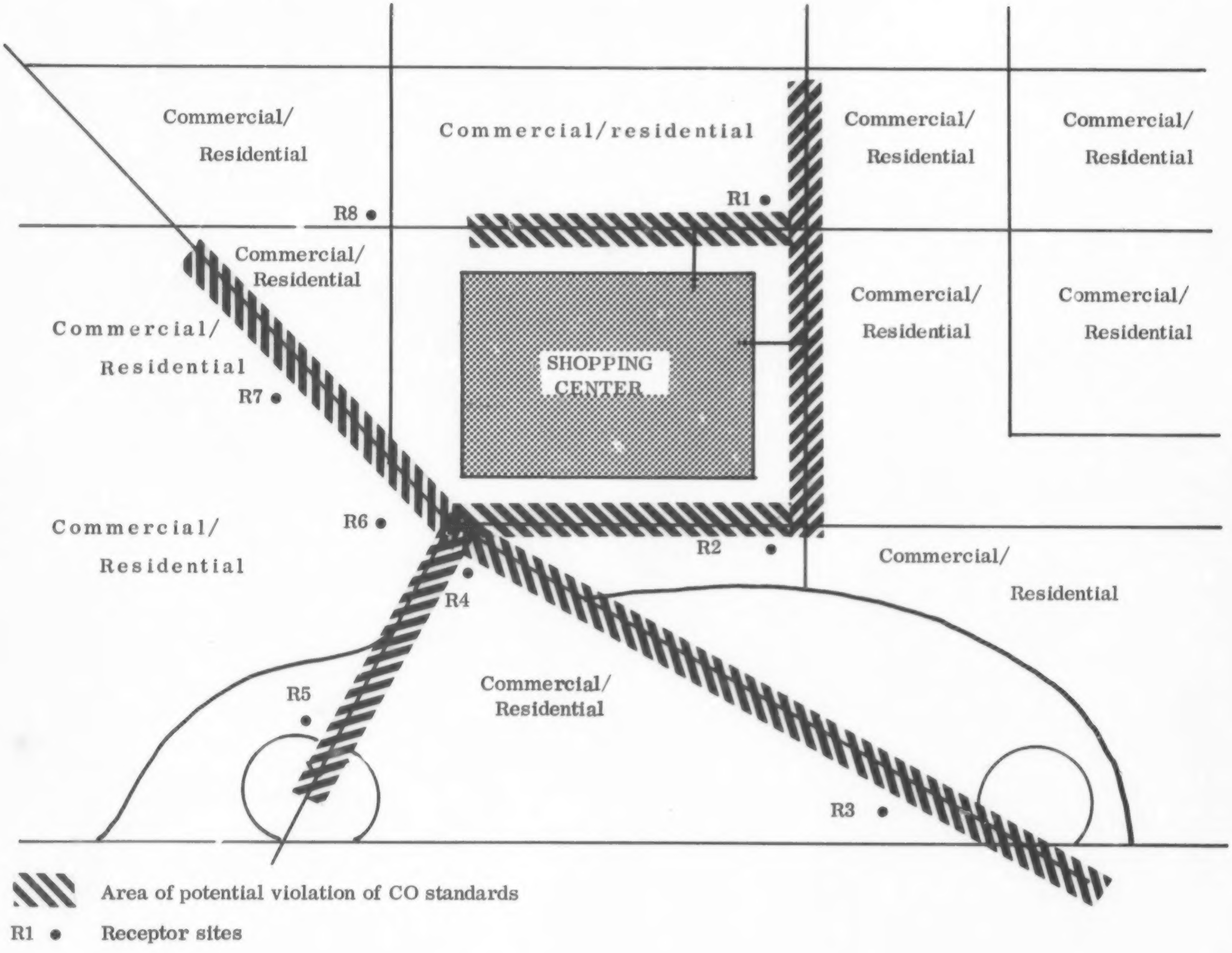
Commercial/ Residential
Commercial/residential
Commercial/ Residential
Commercial/ Residential
R8
R1
Commercial/ Residential
Commercial/ Residential
Commercial/ Residential
Commercial/ Residential
SHOPPING CENTER
R7
Commercial/ Residential
R6
R2
Commercial/ Residential
R4
Commercial/ Residential
R5
R3
Area of potential violation of CO standards
R1 • Receptor sites

EXHIBIT III-10

PROJECT B - COST SHEET

	Without ISR		With ISR Computer Modeling and 90 day delay	
Investment Costs				
Land Acquisition		$ 3,700,000		$ 3,700,000
Construction		27,500,000		
On-Site		- -		
Design Changes			$28,333,300 1,500,000	
				29,833,300
Other				
Architectural & Engineering				
Miscellaneous*	1,100,000		1,100,000	
Indirect Source Review	2,200,000		2,200,000	
Interest During Construction	- - 2,700,000		35,000	
			2,943,000	
		6,000,000		6,278,000
TOTAL PROJECT COST		$37,200,000		$39,811,300

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*Includes legal fees, leasing commissions, consultants fees, taxes during construction, and overhead.

With ISR No Delay	
	$ 3, 700,000
27,500,000	
1,500,000	
	$29,000,000
1,100,000	
2,200,000	
35,000	
2,857,000	
	6,192,000
	38,892,000

The developer estimates a minimum of 18 months just to receive a decision from government agencies on an application to make the recommended design changes. This time delay problem is not unique to ISR. The appeal would have to start with the community planning board and then proceed to the city highway department, the state highway department, and finally the Federal government (in the case of changes to the expressway ramps). The costs of these appeals and the delays would have increased total project costs from $37 million to more than $60 million. A negative cash flow would result, and the project would terminate immediately if these costs could be anticipated. In this analysis the costs attributed to ISR are restricted to the review period itself and include these delays and appeals only by considerating the use of interm transit measures to cover this delay.

ISR preparation costs are estimated as $35,000. The developer has done some traffic analysis that would be duplicated by the preparation, reducing the normal $45,000 cost by $10,000. However, the traffic planning would have to be done earlier in the development process and be covered in the developer's front-end money.

Exhibit III-11 shows that the developer has a cash flow per net leasable square foot of $3.00. This higher-than-usual square foot return is necessary because of the relatively small leasable area provided for tenant stores. Tenant store area generates the return for a developer; department store area just breaks even. Because tenant area comprises a relatively small part of the facility, the developer requires a higher square foot return to receive an acceptable cash flow. This developer looks for an annual cash flow of around $400,000 on a project requiring financial exposure of $40 million. Because ISR costs would reduce the cash flow to less than $130,000 and the square foot return to less than $1.00, the development would probably be stopped by ISR.

1(Cont'd)
however, also enabled the development to attract a large number of automobile riders commuting to and from the suburbs, resulting in the 60-40 modal split cited previously for the facility. If the facility had been located in such a way as to service only the urban population and parking spaces had been reduced in keeping with the high level of transit ridership of this segment of the market, then the facility could probably be constructed and operated incurring only minimal or no ISR-related design change costs.

EXHIBIT III-11
PROJECT B - OPERATIONAL CASH FLOW)

	Without ISR		With ISR Computer Modeling and 90 day delay	
Income				
Net Rental*		$4,710,000		$4,710,000
Expense				
Operating Expenses	$400,000		$400,000	
Unrecaptured Property Taxes**	200,000		200,000	
		(600,000)		(600,000)
Cash Before Debt Service		$4,110,000		$4,110,000
Debt Service		(3,720.000)		(3,981,130)
Cash Flow		390,000		$ 128,870
Cash Flow per Net Leasable Square Foot		$3.00		$0.99

---

*Net rental excludes incremental charges (e.g., portions of property taxes, etc.) which are borne directly by tenants.

**Total property taxes approach $1,500,000.

With ISR No Delay	
	$ 4,710,000
$ 400,000	
200,000	
	(600,000)
	$ 4,110,000
	(3,889,200)
	$ 220,800
	$1.70

This conclusion becomes unmistakable after an examination of the developer's return on his investment before and after ISR. With financing at 75 percent of project costs, which is typical in the development business, the developer has a return on his investment of 14 percent.[1] A projected return of this magnitude would be required in order for the developer to absorb the risks involved. The developer is contemplating financial exposure of $40 million, including more than $9 million of his own funds. If he is successful in receiving unusually high rents from both department stores and tenant stores, and if costs do not escalate beyond those projected, then, after six years of effort he will receive a 14 percent return on equity.

Any additional costs, such as those required by ISR, would increase his own investment in the project. In this project ISR costs would reduce the return on his investment to 11 percent, and the project would become financially risky for the developer to undertake. There are too many uncertainties and there is too much financial exposure for the developer to continue the project in hopes of gaining only an 11 percent return on his investment.

The costs related to ISR would stop development of this project. which was already marginal. The rental rates charges to the department stores are as high as they can be prior to ISR. The tenant stores are playing twice the normal rate and could not bear sufficient quantity of ISR expenditures to save the project. The losses the developer would incur as a result of stopping the project at this stage with no attempt to redefine the project would total $1.35 million, broken down as follows:

• Indirect source review	$ 38,000
• Traffic analysis for ISR	7,000
• Carrying cost of the land	450,000
• Architecture and Engineering	500,000
• Miscellaneous[2]	350,000

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[1] Short-term financing is obtained at 12 percent.

[2] Includes legal fees and overhead.

These losses would impact on the developer's valuable front-end money, which is required to initiate new developments. Early recognition of the problem created by the center's location and market may have prevented the total loss of the project's front end investment, through a decision to relocate the facility or other redefinition of the project.

3. Project C

a. General Description. Project C is located in the central business district of a major city. It is a mixed-use development with more than two million square feet of gross leasable area combining office and commercial uses. The site is conveniently served by mass transit. Parking is provided in enclosed and multilevel structures.

Extensive demolition activity preceded the development of Project C. The site was characterized as a rapidly declining area with much unused residential and commercial space. Small at-grade parking lots were common. Project C was conceived as an attempt to revitalize a decaying section of the downtown area.

More than one developer has been involved with Project C since its conception. The high risk associated with downtown development, aggravated by delays for political approval, forced certain ventures out in the early years. Even the present developer had to prepare four different proposed site plans, each of which represented a significant departure from the previous one and thus required multilevel political approval.

The site plan revisions chart an interesting project history. Each one represented an improvement for aesthetic reasons; the final design also incorporated significant traffic-related changes. The parking spaces on site were reduced by 20 percent. This change was partially in response to foreknowledge of the management of parking supply element in the local transportation control plan, although aesthetics also were a major consideration. The developer estimates that the reduction in the number of parking spaces and the changed parking location cost $2.7 million. This total represents increased costs for parking because of underground construction,[1] increased land costs resulting from the dropping of one department store to build a central multidecked parking garage, consultants' fees, delays in the face of escalating construction costs, and so forth.

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[1] Although the costs of underground construction cannot be broken out, this portion of the total is related to aesthetic decisions for the parking lot design rather than any design characteristics pertinent to ISR or parking supply management.

The final design scheme was purposely designed to minimize Project C's impact on traffic congestion; thus, it would not be a major problem in complying with indirect source regulations. The only exception to meeting ISR provisions would be in terms of how and where exhausts are vented from the enclosed garage in order to minimize the impact on ambient air quality. Because the EPA Technical Guidelines are not designed to analyze enclosed multilevel parking facilities, final resolution of the need to adjust the ventilation system was not possible within the confines of this study.

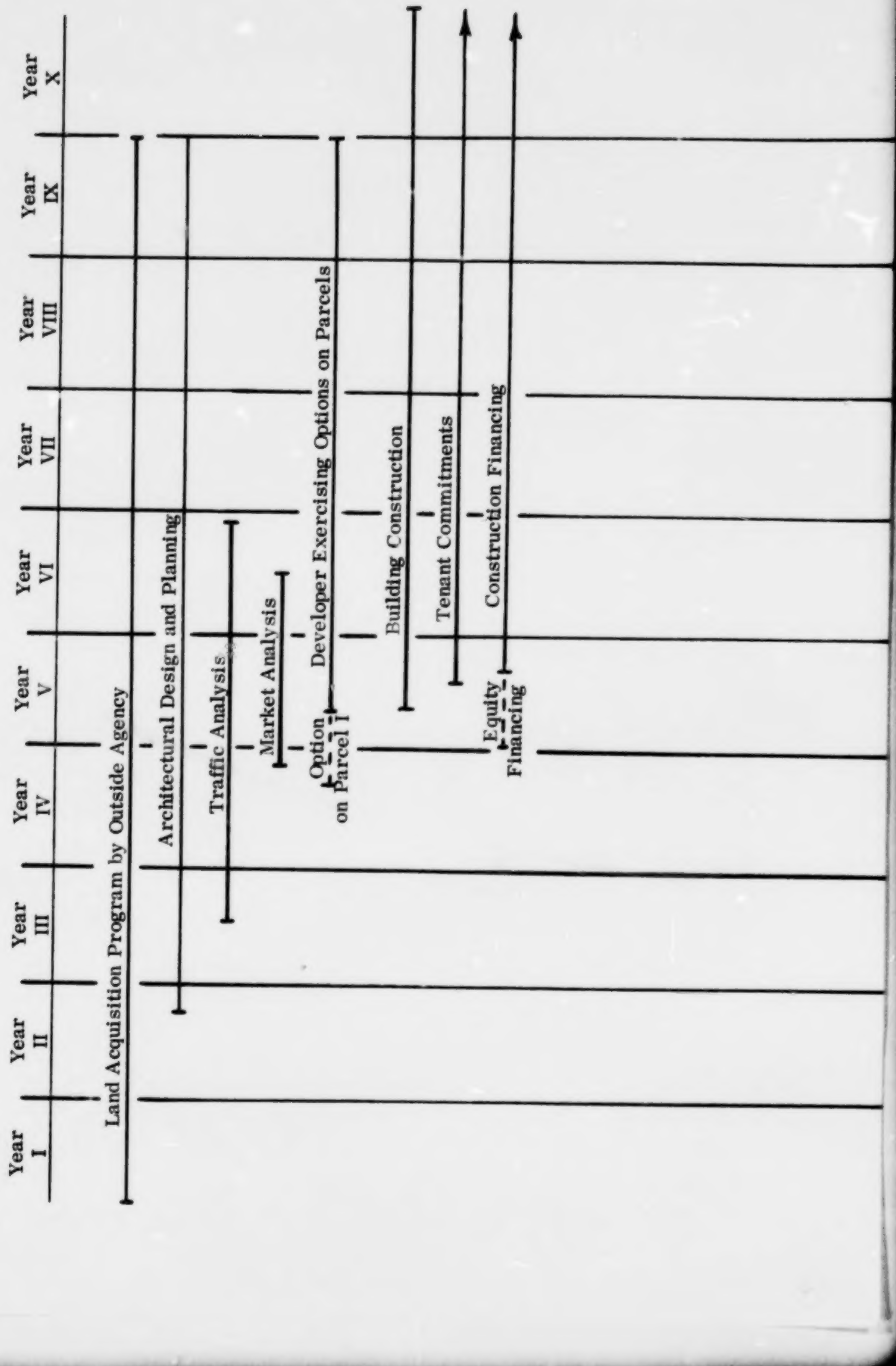
b. Development Process. Downtown projects are often problematic to developers because of the fragmented ownership of land parcels. Project C was no exception. The land-banking program spanned nine of the ten years of the development process (see Exhibit III-12). The developer, however, had no responsibility for acquiring the land directly. Rather, a redevelopment agency packaged the land in parcels prior to each stage of development. Furthermore, in the event of time delays, the developer was protected by options on the property. Each parcel taken down by the developer was already zoned for the uses he proposed to construct and represented a discrete phase in the multistaged project.

The remaining stages in Project C's development process were as follows. An architect/planner was commissioned toward the end of Year II to begin preparing site plans. Traffic analysis was started nine months later. Market analyses were contracted for toward the end of Year IV. At that point, the developer still had some flexibility in terms of how much of a given use should be represented.

The developer took title to the first three-block parcel in the spring of Year V and began construction concurrently. It is here that a significant

EXHIBIT III-12

PROJECT C - DEVELOPMENT PROCESS



departure from orthodox real-estate decision-making is evident: the developer broke ground without an anchor tenant commitment for his first structure, an office building. Furthermore, he financed the first five months of construction out of his own equity. The construction loan on the first building did not take effect until late summer, after the major tenant commitment had been finalized.

It is assumed that indirect source review would not have impacted on this project until the end of Year VI or Year VII, prior to the construction of the first parking facility. The reason for this is twofold: Parking for the first office building was below the trigger point for review, and designs for the first major parking facility had not yet been finalized. Ground was broken for the first office building in Year V. Ground was broken for the second building in Year VII; the design for this second building incorporated plans for parking in excess of the ISR cutoff point.

The developer would have sought approval for all of his major parking facilities at the end of Year VI or early in Year VII in order to avoid a major change in plans at a later date. The development concept which was finalized in Year VI incorporated all on-site parking facilities, not just the next one scheduled for construction.

The cost analysis for this project is presented to reflect a single review for all parking facilities prior to construction of the first facility. The developer would have preferred to have as much uncertainty as possible removed at the earliest point in time.

c. Air Quality Findings. Trip generation rates for this mixed-use development vary according to vehicle origin/destination within the facility. During the retail peak hour, 3.0 trips per 1,000 square feet of retail space and 0.72 trips per 1,000 square feet of office space are generated.

The surrounding road network is designed roughly as a grid and is composed primarily of four-lane streets. A four-lane expressway with ramps providing direct access into the center's retail garage bounds the development on one side.

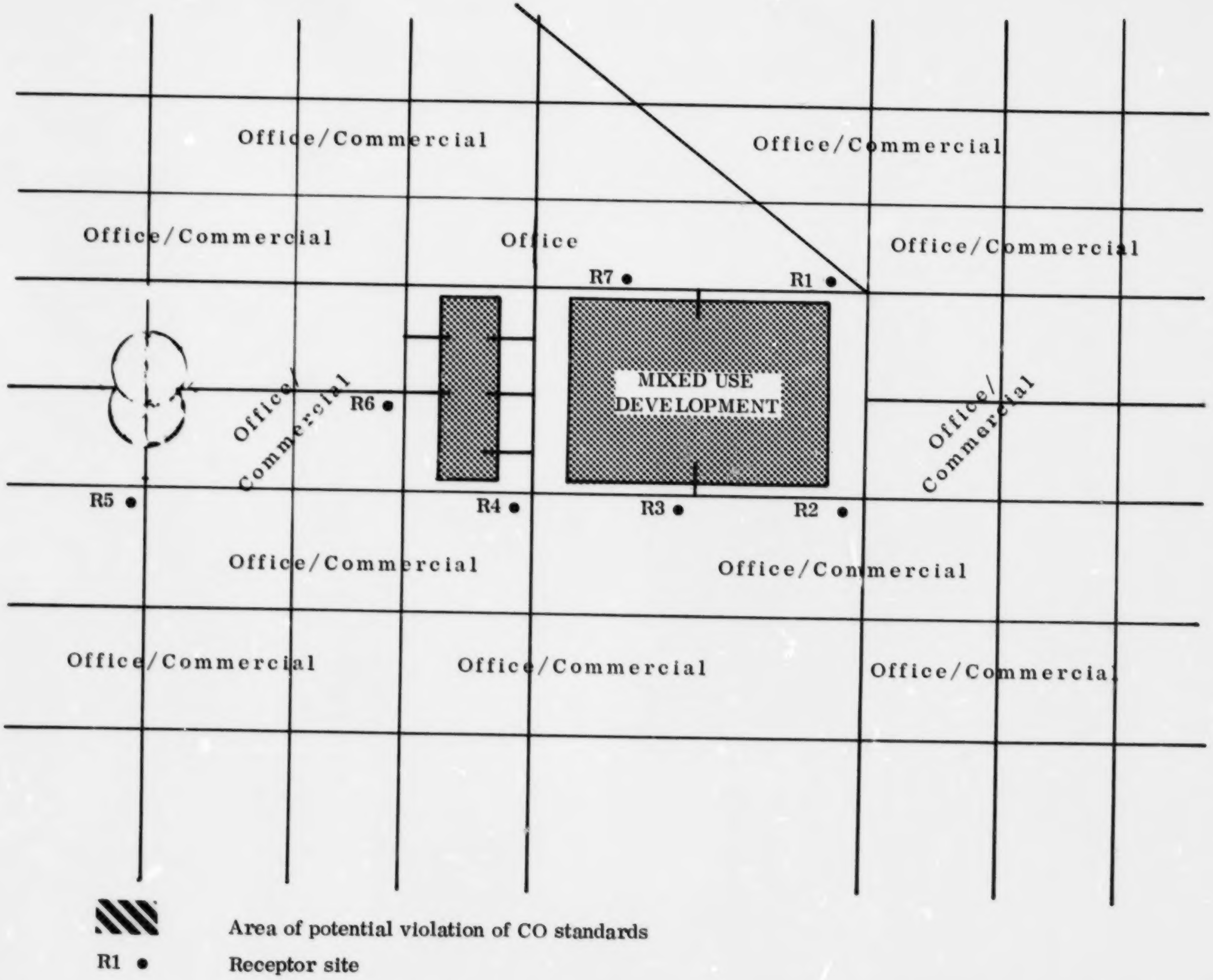
The retail garage is the largest of the two parking structures. Built on four levels, it provides about 3,000 spaces and takes up three city blocks. Access is provided by a one-way pair of streets, one depressed and one at ground level, in addition to elevated expressway ramps. Fifty-eight percent of the garage traffic uses the elevated ramps which provide separate entrance and exit gates of three lanes each. Twenty-eight percent use the depressed road, entering at one two-lane gate and exiting at one two-lane and one single-lane gate. The remaining 14 percent use the two one-way gates at street level which provide two entrance lanes and three exit lanes.

A separate three-level garage of 1,150 spaces provides for office and hotel parking. Located underground within the development, the garage is accessible on two sides. One gate on each side provides both entrance and exit on two lanes. The use of these gates is balanced. There is no connection between the first and second levels in the garage; the second and third levels do connect, however.

Use of the EPA methodology in this case yielded interesting and problematic results. In all places the CO concentrations along the road segments did not violate both one-hour and eight-hour standards (see Exhibit III-13). However, the parking garage emissions, when modeled in the only known manner (as several at-grade lots), equaled 33 ppm during one-hour periods and 19.8 ppm during the peak eight-hour period. When these area source emissions were added to the roadway emissions, several of the roads downwind from the site exceeded the one-and/or the eight-hour standard.

The modeling method is admittedly at fault here. However, no appropriate method has been developed for a multilevel, partially enclosed parking facility. In view of this situation a decision was made not to recommend design changes on the roads which exceeded standards. Even if another methodology

EXHIBIT II-13
PROJECT C - SCHEMATIC LAND USE PLAN


Office/Commercial
Office/Commercial
Office/Commercial
Office/Commercial
Office
R7
R1
MIXED USE DEVELOPMENT
R6
Office/Commercial
Office/Commercial
R5
R4
R3
R2
Office/Commercial
Office/Commercial
Office/Commercial
Office/Commercial
Office/Commercial
Area of potential violation of CO standards
R1 ●
Receptor site

were developed to handle this case and the garage concentrations were still found to be high, it can be assumed that a carefully planned ventilation system would minimize the impact of CO from the facility on the surrounding roadnet.[1]

d. Cost Analysis. Project C involves a complex of buildings constructed over a six-year period. The first building would not in and of itself have required ISR because parking for it was well below the regulation level. Additionally, land for subsequent construction was to be acquired as needed. There was no option cost for this sequential land take-down, and the land arrangement contained a proviso indicating that the developer would not be financially responsible for subsequent parcel acquisition if any public agency prohibited the remainder of the planned project. Thus, the second building becomes the critical structure in the project for ISR, because this structure was built concurrently with a garage which contains more than 1,000 parking spaces.

From the unusual land acquisition arrangement described above, it might be assumed that if indirect source regulations prohibited construction of the second building and its associated parking, the impact on the developer would be minimal since he would not have to carry additional land. Further, the financing for the first building was structured to include all of its costs and still yield a worthwhile return.

However, the developer would most likely be in a break-even or loss position for many years if his second building were to be stopped; planning a multibuilding project involves substantial front-end expenses. Although the first building covered its own costs, it was not financed to carry the costs of planning for the entire project. In this case the developer, who knowingly operated in a loss position until his second office building was built and tenanted two to three years after he broke ground on the first building, took a substantial risk.

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[1] In such a situation, the parking facility itself becomes a stationary source as opposed to an indirect source.

The project planning costs do not show up as separate items in Exhibits III-14 and III-15 prior to indirect source review. Some of them might be hidden in categories such as architectural and engineering fees and overhead items. Many of them would not show up on the statements for the second building since they would be distributed over all subsequent project construction.

Exhibits III-14 and III-15 incorporate the hypothetical economic impact of ISR on the developer's financial position. The air quality impact analysis shows that CO emitted by the traffic generated by Project C would not exceed NAAQS. In fact, no design changes would be required under ISR. Consequently, the only incremental expenses would be the following.

- $5,000 for traffic consultants' fees over and above the work already prepared.[1] If the Technical Guidelines were applied first and it was determined that there would be no violation costs of data collection and analysis may be limited to $3,000 (see section D).

- Under the assumption of three-month delay for ISR, an estimated $423,870 for escalating construction costs, plus a total of $42,887 in ISR-related interest charges, would be incurred. Proper planning of ISR, however, may eliminate some or all of the time-related costs (see the sensitivity analysis in Section D).

Under conditions of a cost of $5,000 for preparation of the ISR application and a 90-day delay, the project costs would increase by $471,757, compared to an approximate increase of $3,000 using the technical guidelines and with no delay costs (see Exhibit III-14).

Even with a 90-day delay, nevertheless, the impact of ISR on the developer's net cash flow would be a drop from $1.10 to $1.00 per square foot. The industry rule of thumb is to look for a $1.00 return per square foot of net rentable office area. Because

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[1] Since public funds were involved, an EIS was carried out at the beginning, thereby minimizing expenses related to ISR.

EXHIBIT III-14
PROJECT C - COST SHEET

	Without ISR		With ISR Computer Modeling & 90 day delay	
Investment Costs				
Land		$ 775,000		$ 775,000
Construction				
Site Improvement	$ 900,000		$ 900,000	
Buildings	14,129,000		14,552,870	
Tenant Work	4,371,000		4,371,000	
		19,400,000		19,823,870
Other				
Loan Commitment	350,000		350,000	
Construction Loan & Interest	1,763,000		1,805,887	
Architectural & Engineering	626,000		626,000	
Interior Design	426,000		426,000	
Supervision & Other Overhead	1,367,000		1,367,000	
Legal	50,000		50,000	
Insurance	393,000		393,000	
Taxes During Development	70,000		70,000	
Advertising & Promotion	100,000		100,000	
Leasing Commission	890,000		890,000	
Anchor Tenant Fee Rent/ Existing Lease Buy-Out	875,000		875,000	
Miscellaneous & Contingency	665,000		665,000	
ISR	--		5,000	
Subtotal		7,575,000		7,622,387
TOTAL PROJECT COST		$27,750,000		$28,221,757

With ISR Technical Guidelines and No Delay	
	$ 775,000
$ 900,000	
14,129,000	
4,371,000	
	19,400,000
350,000	
1,763,000	
626,000	
426,000	
1,367,000	
50,000	
393,000	
70,000	
100,000	
890,000	
875,000	
665,000	
3,000	
	7,578,000
	$ 27,753,000

EXHIBIT III-15
PROJECT C - OPERATIONAL CASH FLOW

Income	Without ISR		With ISR Computer Modeling and 90 Day Delay	
Gross Rental		$5,280,000		$5,280,000
Less Vacancy and Rent Loss @ 5%		(264,000)		(264,000)
Net Rental Income		$5,016,000		$5,016,000
Expense				
Operating Other than Taxes (includes maintenance, management, insurance)	$1,200,000		$1,200,000	
Property Taxes	912,000		912,000	
		(2,112,000)		(2,112,000)
Cash Before Debt Service		$2,904,000		$2,904,000
Debt Service		(2,376,500)		(2,422,260)
Pre-Tax Cash Flow		$ 527,500		$ 481,740
Pre-Tax Cash Flow per Net Square Foot		$ 1.10		$ 1.00

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*The developer entered into a partnership with a financing institution for the development, ownership, and sale of this building. The financing institution advanced funds for less than the total program cost of the building.

With ISR No Delay
$5,280,000
(264,000)
$5,016,000
$1,200,000
912,000
(2,112,000)
$2,904,000
(2,376,820)
$527,180
$ 1.10

$1.00 meets the developer's return objective, it is unlikely that the loss of $0.10 per square foot would be passed along to the tenants in increased rents. This conclusion is substantiated by the existing rents that average $11 per square foot, which is very high for the metropolitan area under consideration. The developer would have difficulty convincing tenants to absorb any increase in excess of this amount.

A reduction from $527,500 to $481,740 ($1.10 per square foot down to $1.00) represents an 9 percent decline in the pre-tax cash flow. This is a considerable drop from the developer's standpoint. However, it is important to relate a reduction in pre-tax cash flow back to income to assess the real impact of a new expense. The loss in cash flow represented by ISR would be $45,760 ($527,500 - $481,740). This figure represents less than one percent of net rental income, a fairly insignificant amount.

ISR would have had only a minor impact on the timing of a net positive cash flow return. Project C reached a turnaround position in terms of revenue 17 months after the time of initial occupancy when the building first opened. Full occupancy (estimated at 95 percent) was achieved five months later. The additional ISR costs, totaling $471,757, would have delayed the net positive cash flow by one month, using the time the building first opened as the starting point. Full occupancy would have occurred in 22 months, the same timing as without ISR.

Project C is unusual since the developer did not mortgage out at the time construction began on his second building. Rather, he entered into a partnership with the lender who advanced $24.5 million for the permanent financing. This arrangement meant that some of the developer's equity was tied up in construction. As a result, the developer is much more concerned with the long-term appreciation of his project and its attractiveness to potential purchasers. ISR would not have affected the appreciation capabilities of the project.

4. Project D

a. General Description. Project D is a mixed-use development located well within the limits of a major city but away from the heart of the central business district. More than one million square feet of commercial and office space are represented, along with several hundred residential units. Project D is part of the city's urban renewal program and is eligible for certain tax benefits. On balance the project has improved an area originally populated by small manufacturing operations, older warehouses, office buildings, and commercial activities. The development has converted an unsafe zone which most downtown residents avoided into a viable locus teeming with people.

Although served by several bus lines, the development incorporates extensive on-site parking in enclosed structures. The following ratios were applied for the major parking facilities:

1 space per 1,000 square feet of net leasable office area

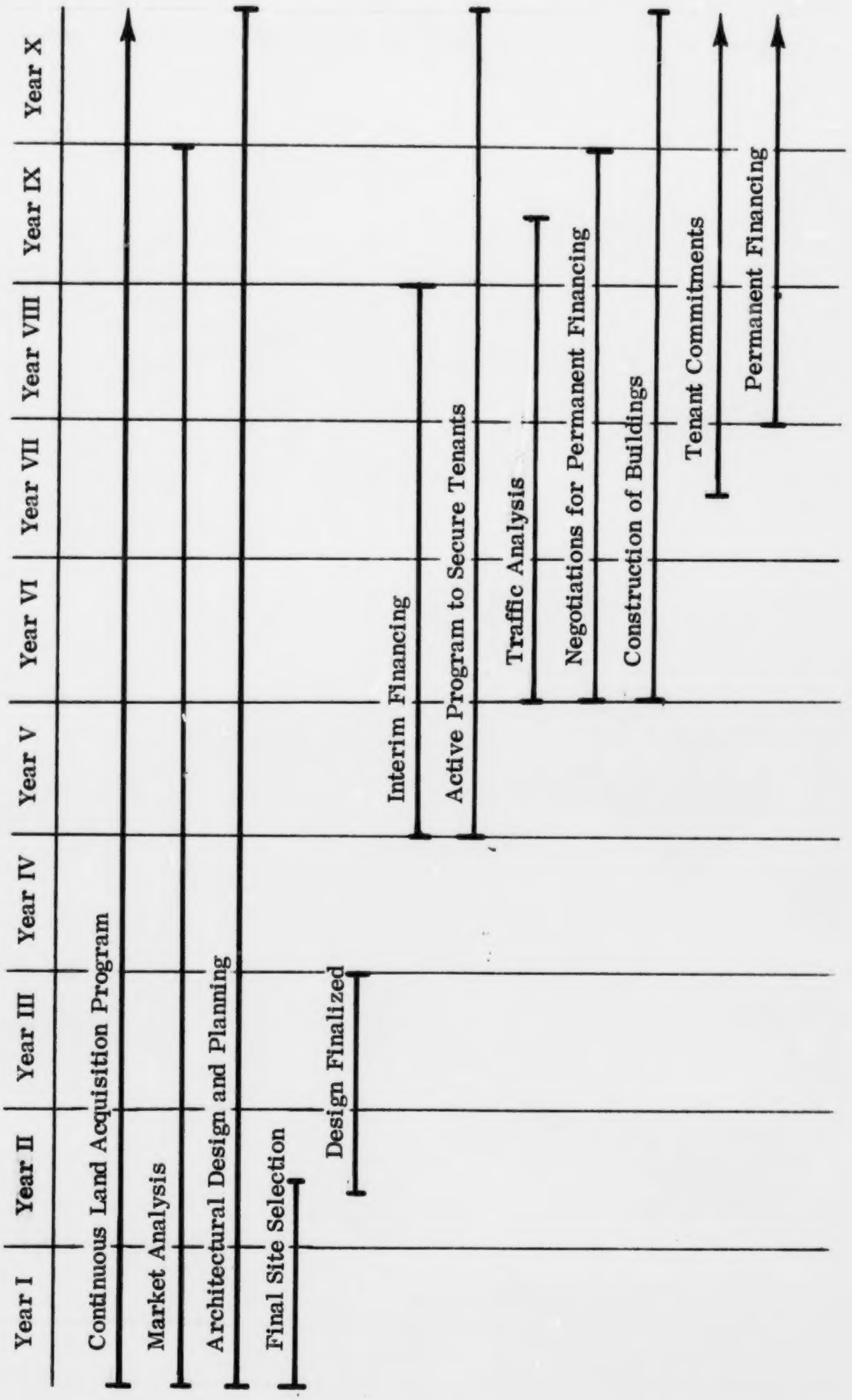
3 1/2 - 4 spaces per 1,000 square feet of net leasable retail area

There is no parking management program planned or in effect for Project D. Although the city does not have a full-fledged transportation control plan, it is actively encouraging transit usage and carpooling.

b. Development Process. The land-packaging program ran the entire length of Project D (see Exhibit III-16). An agency separate from the developer has been responsible for purchasing contiguous parcels from a proliferation of owners. From the outset the developer began an active market analysis program which has been constantly refined and updated.

The market consultant's recommendations for the highest and best uses were balanced with the developer's conception of the magnitude of services his project would offer. Therefore, economics was not the sole dictator of

EXHIBIT III-16
PROJECT D - DEVELOPMENT PROCESS



design. An architect/planner was brought on board in Year I as the development concept was beginning to crystallize. In Year II the actual boundaries of the site were finalized.

Active negotiations with the city for plan approval began in Year II. A plan was filed officially early in Year III and approval given during that year.

During Year V an interim loan became effective to cover the initial construction which started in Year VI. Prior to groundbreaking the developer began an active tenant program. Not until Year VII was the first major tenant committed, however.

Back in Year VI a traffic consultant was hired to prepare a traffic study which was published in Year VII. The architect/planner brought onstream at the outset had incorporated some design features for traffic flow in all of his plans. The need for more detailed analysis, however, did not arise until ground was actually broken for the first complex of buildings.

Permanent financing became effective in Year VIII after two years of active soliciting among lenders. With tenants starting to commit themselves in Year VII, the financial community took a more favorable view of the development's feasibility and was willing to advance funds.

ISR would logically have fallen in Year V, prior to construction of the first building complex. It is assumed that the traffic analysis would have been moved back to at least Year V in order to meet the requirements of the review process.

c. Air Quality Findings. In this mixed-use development trip generation varies with traffic origin/destination within the center. During the peak hour the office space generates 2.33 trips per 1,000 square feet and the retail space generates 2.06 trips per 1,000 square feet.

The surrounding roadnet is comprised of two-, four-, and six-lane roads forming a rough grid around the project. Bordering the site on three sides are three 4-lane roads. Two of these roads meet and end at their junction, forming an offset intersection with the end points of two other roads, one a two-lane and the other a four-lane road. A six-lane road runs directly through the site and despite its heavy peak-hour load empties into the third road bordering the site.

Peak-hour traffic, particularly on the roads just indicated, is unusually unbalanced by direction. In some instances peak directional volumes are five or six times as high as the off-peak direction. This condition has potential to create severe overload on any road that does not have overcapacity built in.

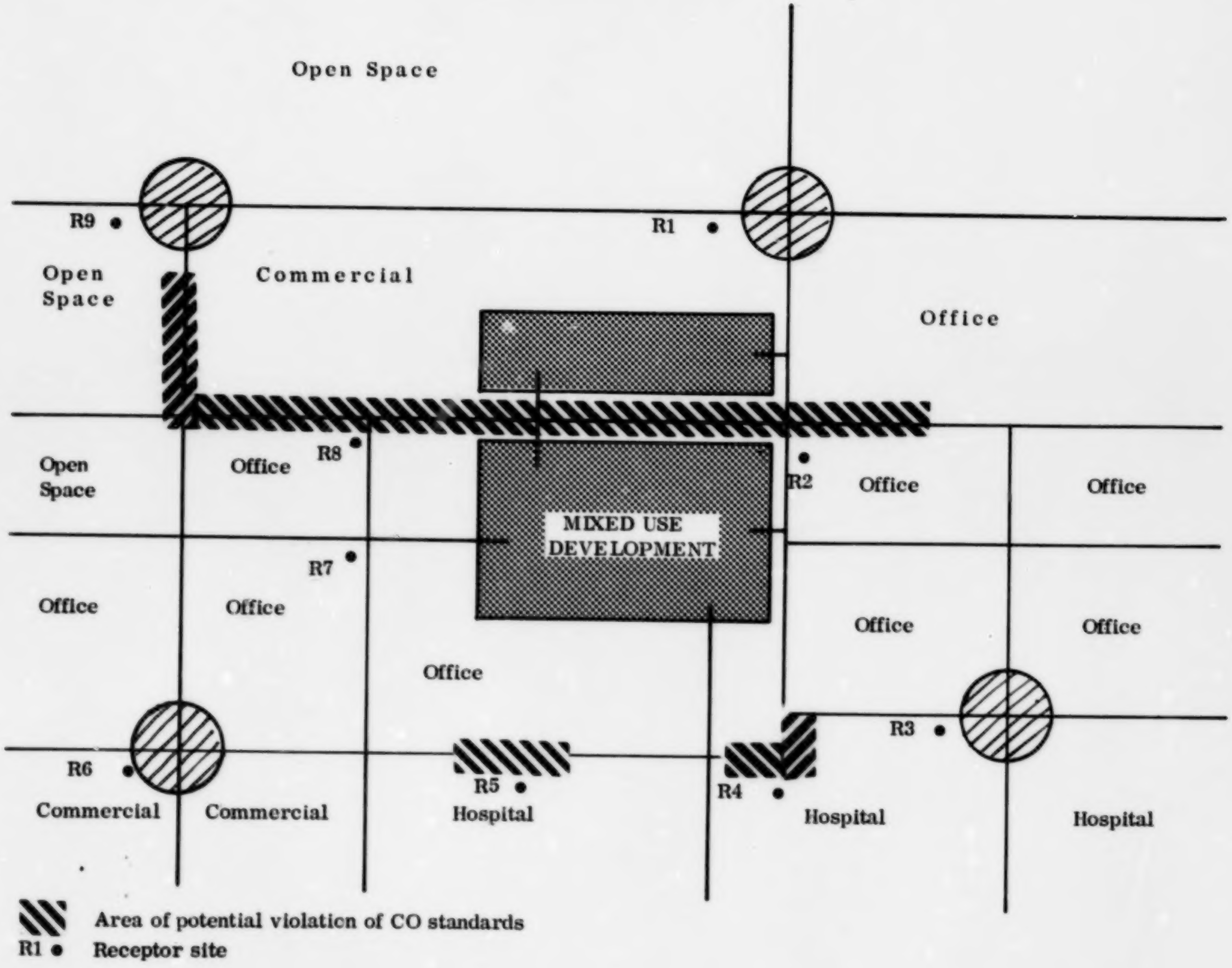
Traffic to the site enters immediately off the street through six gates to three multilevel garages. Four gates provide access and egress to one garage. There is one gate each for the second and third garages. All three garages are connected and all three employ persons to direct traffic to available spaces by the shortest route.

Use of the EPA methodology showed severe air quality problems on several roads surrounding the site (see Exhibit III-17). Calculations showed nine 1-hour violations and five 8-hour violations.

Roadway design changes to bring the area into compliance at least cost would require several minor adjustments. At one intersection adjacent to the site, improving the signalization by replacement of the existing signal and the addition of a timer would bring three 8-hour violations into compliance at a cost of $19,000.

Some major improvements would also have been necessitated. Realignment of the intersection where the end points of four roads meet and the widening of one of the approaches from four to six lanes would bring five of the one-hour violations into compliance at a cost of $147,000. The addition of a

EXHIBIT III-17
PROJECT D - SCHEMATIC LAND USE PLAN


Open Space
R9
R1
Open Space
Commercial
Office
Open Space
Office
R8
R2
Office
Office
MIXED USE DEVELOPMENT
R7
Office
Office
Office
Office
Office
R3
R6
R5
R4
Commercial
Commercial
Hospital
Hospital
Hospital
Area of potential violation of CO standards
R1 ● Receptor site

peak-hour lane on the road through the site would alleviate two 1-hour problems at a cost of $96,000. Extension of that road to its appropriate connection would reduce the problems created by its emptying into a four-lane facility. At a cost of $356,000 two 1-hour violations would be brought into compliance. Finally, the widening of another bordering road from four to six lanes would rid the area of the last two 8-hour violations. In order to prevent a bottleneck at a four-lane bridge farther up the road, in addition to the roadway widening the capability of two more lanes would have to be added; the cost would be $789,000. A carpooling program was also considered for Project D. The potential violations were sufficiently high that the program would not eliminate any of the highway design changes listed above. Since the design changes were required anyhow, an additional cost for setting up a carpooling program was not added to the total highway-related design change costs. In the case of transit-related changes, however, although the projected effectiveness was the same as in the case of the highway options, it was a critical element in conjunction with other transit options in lowering CO concentrations below NAAQS. Therefore, carpooling costs were included in the transit-related calculations.

d. Cost Analysis. The developer of Project D is unique among the development companies represented in the case study analyses in that he represents a subsidiary of a publicly held conglomerate. The parent company is attracted to real estate (i) to fulfill a social commitment to revitalize decaying downtown areas and (ii) as a tax shelter. These two development criteria vary significantly from those generally cited for real estate projects, such as minimization of front-end investment, positive cash flows at attractive returns per gross leasable square footage, and creating a spread between a project's capitalized value and its costs.

The following discussion will focus primarily on the tax shelter criterion and how it can operate to the advantage of a major corporation. In order to illustrate the tax shelter mechanism, it is necessary to present a profit and loss statement[1] for the project in addition to a project cost sheet and operational cash flow.

Almost $114 million was spent on Project D in land, construction, and other investment items (see Exhibit III-18). The project generates an average annual negative cash flow of $2,879,000 (see Exhibit III-19). Such poor performance is partially offset by the tax shelter benefit which is explained below.

Losses generated internally to a corporation, when offset against profits, will reduce corporate income taxes--thus the term tax shelter. Ventures involving large depreciation expenses are particularly appropriate for a tax shelter since depreciation has no impact on cash outflow.

The profit and loss statement for Project D (see Exhibit III-20) shows a pre-tax loss of $3,982,000. This loss is larger than the pre-tax negative cash flow shown in Exhibit III-19 because of depreciation charges on buildings and related improvements. This loss, when incorporated into the financial statements of the conglomerate, will reduce overall pre-tax profits and, thus, the base on which income taxes are computed.

The tax shelter is derived by applying the corporate income tax rate to the pre-tax loss, in this case:

$$0.48 \times \$3,982,000 = \$1,911,360$$

The $1,911,360 in effect represents the tax saving that would accrue to the parent by declaring the $3,982,000 loss in operating income. Ideally, the tax shelter would offset the pre-tax cash losses if it were the only feasibility criterion applied by a corporation. The tax shelter in the case of Project D is $967,640 less than the pre-tax cash loss. Therefore, the $967,640 loss would have to be absorbed internally by the parent corporation.

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[1] A profit and loss statement differs from a cash flow statement for the same time period in two ways: it includes a charge for depreciation, a non-cash expense; and it does not include a deduction for amortization of the principal on a loan.

EXHIBIT III-18
PROJECT D - COST SHEET

	Without ISR	
Investment Costs		
Land		$ 3,800,000
Construction		
Buildings	$80,400,000	
Site Improvements	7,700,000	
Interior Work	5,600,000	
		93,700,000
ISR Design Costs		--
Other		
Architectural & Engineering	4,824,000	
Financing	8,040,000	
Project Management	804,000	
Legal Fees	350,000	
Accounting/Property Taxes/ Counsultants other than A & E	454,000	
Contingency	2,010,000	
ISR-Consulting Fees	--	
ISR-Related Interest Charges	--	
		16,482,000
TOTAL PROJECT COST		$113,982,000

With ISR With Computer Modeling and 90 Day Delay		With ISR No Delay	
	$ 3,800,000		$ 3,800,000
$81,174,000		$80,400,000	
7,700,000		7,700,000	
5,600,000		5,600,000	
	94,474,000		93,700,000
	1,443,000		1,443,000
4,824,000		4,824,000	
8,040,000		8,040,000	
804,000		804,000	
350,000		350,000	
454,000		454,000	
2,010,000		2,010,000	
40,000		40,000	
225,700		148,300	
	16,747,700		16,670,300
	$116,464,700		$115,613,300

EXHIBIT III-19
PROJECT D - OPERATIONAL CASH FLOW

	Without ISR		With ISR with Computer Modeling and 90 day delay	
Income				
Net Rentals (reflects relevant vacancy factors)	$6,372,000		$6,372,000	
Other Income	4,550,000		4,550,000	
		$10,922,000		$10,922,000
Expenses				
Maintenance	809,000		809,000	
Overhead	675,000		675,000	
Utilities & Property Taxes	1,119,000		1,119,000	
Promotion	654,000		654,000	
Other	508,000		508,000	
		(3,765,000)		(3,765,000)
Cash Before Debt Service		$ 7,157,000		$ 7,157,000
Debt Service		(10,036,000)		(10,276,000)
Pre-Tax Cash Loss		($ 2,879,000)		($ 3,119,000)

With ISR No Delay	
$6,372,000	
4,550,000	
	$10,922,000
809,000	
675,000	
1,119,000	
654,000	
508,000	
	(3,765,000)
	$7,157,000
	(10,103,000)
	($3,036,000)

EXHIBIT III-20
PROJECT D - PROFIT AND LOSS STATEMENT

	Without ISR		With ISR Computer Modeling & 90 Day Delay		With ISR. No Delay	
Income						
Net Rentals (reflects relevant vacancy factors)	$6,372,000		$6,372,000		$6,372,000	
Other Income	4,550,000		4,550,000		4,550,000	
		$10,922,000		$10,922,000		$10,922,000
Expenses						
Maintenance	809,000		809,000		809,000	
Overhead	675,000		675,000		675,000	
Utilities & Property Taxes	1,119,000		1,119,000		1,119,000	
Promotion	654,000		654,000		654,000	
Other Items	508,000		508,000		508,000	
Depreciation*	3,123,000		3,171,000		3,160,000	
Interest	8,016,000		8,241,000		8,164,000	
		(14,904,000)		(15,177,000)		(15,089,000)
Pre-Tax Cash Loss		($3,982,000)		($ 4,255,000)		(4,167,000)

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*Using a straight-line method for 30 years.

Despite the obvious advantages to the parent company in the way of tax benefits, there are caveats that must be kept in mind. As a publicly held company the parent must be sensitive to its stockholders when proposing any change in corporate philosophy of financial condition. In the case of Project D, even though the loss from the subsidiary is carried over to the parent and certain tax benefits achieved, the loss may be too large to keep the consolidated corporate earnings at a level which meets the expectations of the stockholders. Dividend payments could be restricted to past levels or not paid at all. A reduction in earnings could also mean that internally generated funds would not be adequate to meet the company's long-term growth parameters.

The ultimate effects of stockholder dissatisfaction can be seen in the market value of the stock. Barometers such as price/earnings ratios and dividend payments are closely scrutinized when analyzing a stock, and if these criteria do not measure up to stockholder expectations, existing stockholders will sell their shares and potential stockholders will either look elsewhere for investments or buy the parent company's stock, but at a lower market price. The ramifications of this situation are that the market value continues to decline and the ability to raise capital publicly is severely impaired.

Options open to the management of the parent company, should this situation occur with regard to Project D, would be to change the performance of the subsidiary to income producing, to reduce substantially the losses incurred, or to sell it completely.

If implemented, subsequent phases of the development would help offset the losses shown on the cash flow and profit and loss statements. These phases are envisioned as producing high revenues with relatively low fixed costs. Also, the visibility gained from downtown renewal would probably boost the conglomerate's sales in other areas over time.

With proper planning ISR should not result in the developer incurring additional delay-related costs. If delay costs are not avoided, however, a three month delay for review could increase developer costs as follows:

$1,443,000	Roadway design changes
40,000	Additional traffic consulting fees to meet requirements of ISR
774,000	Construction cost escalation @ 1% per month during 3-month review period (assumes delay on only first structure built on site)
$2,257,000	
225,700	Estimated interest charges on amounts drawn during interim financing over 2-year period
$2,482,700	

The timing of ISR would not affect the cost of land since the developer could acquire the land at his convenience from the agency responsible for land banking. With and without a 90-day delay, ISR-related costs when superimposed over the financial statements (see Exhibits III-18 through III-20) have the following impacts:

- With a 90-day delay project costs are increased from $113.9 million to $116.5 million (see Exhibit III-18). Without a delay costs are increased to $115.6 million.
- With a 90-day delay the pre-tax cash loss is increased by $240,000 (from $2,879,000 to $3,119,000) (see Exhibit III-19). Without a delay the pre-tax is increased by $157,000.
- With a 90-day delay the pre-tax loss shown on the profit and loss statement increases $273,000, from $3,982,000 to $4,255,000 (see Exhibit III-20). Without a delay the increase on the profit and loss loss statement is $185,000.
- With a 90-day delay the revised differential between the tax shelter (0.48 x $4,255,000 = $2,042,400) and the pre-tax cash loss is $1,076,600. The developer had been losing$967,640 without ISR; thus, ISR would cause him to lose an additional $108,960. Without a delay the additional loss would be $68,200.

How would these impacts have affected the developer's decision process ? Even with a three month delay the developer would probably have absorbed all of the ISR-related costs.

The impact of ISR on the actual incremental loss to the developer is $108,960. This figure represents 4 percent of the developer's original real loss, or 1 percent of annual revenues.

Shifting to transit-related design changes, the area is characterized by good service. Buses operate at short headways, picking up passengers at convenient intervals. Schedules are posted at bus stops, and benches are provided for waiting riders. Despite the service, the system is underutilized. Improvements in air quality from volume-decreasing design changes, consequently, would have to come from an incentive program for transit use, a disincentive program for automobile use, or both.

The prime contributor to the peak-hour CO violation is the office use. A volume-decreasing program should therefore focus largely on the office employees. Two possibilities would be to institute a carpooling program with an anticipated effectiveness of 5 to 10 percent[1] and to subsidize transit usage by employees located at Project D. Assuming half the employees would use the existing transit system at the developer's expense, the cost would be almost $150,000 annually.[2]

A program of staggered work hours was ruled out for Project D. Because the development was comprised of multiple uses, each with different periods of maximum traffic flow, a staggered work hour program would simply shift the peak hour CO level to another time of the day.

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[1] Joel L. Horowitz, "Transportation Controls Are Really Needed in the Air Cleanup Fight," Environmental Science & Technology, VIII, no. 9, September 1974, p. 804.

[2] The precise effectiveness of certain volume-decreasing design changes is unknown for this project. Assumptions have been made regarding the effectiveness of implementing multiple volume-decreasing options. A discussion of the effectiveness of different design changes is presented in Appendix F.

The office use, however, is not the sole contributor to the air quality problem, particularly over an eight-hour period. It would therefore be helpful to create an alternative for people patronizing the retail area of the development. A dial-a-ride system could be set up to service the retail facilities. People would be picked up at their homes and taken to Project D at no additional expense. This personalized service is particularly suited to shoppers who generally prefer the convenience of auto-type travel. The coordination of trips to different areas using a dial-a-ride system would help reduce auto use.

Costs for all three of these programs--carpooling, transit subsidies, and dial-a-ride--are presented in Exhibit III-21. The capital costs incorporate purchase of the dial-a-ride vehicles, promotion for the dial-a-ride system to alert people to its existence, and the setting up of a carpooling program. The carpooling campaign would combine some promotion with analysis of likely rider combinations based on origin/destination patterns for on-site employees and their preferred hours of travel to and from the project.

The operating costs presented on an average annual basis combine the costs to run and maintain the dial-a-ride system, the cost of the transit subsidies to the developer, and the maintenance of the carpooling program over time. It seemed only reasonable to assume total subsidies of both the dial-a-ride and transit services in light of the minimal utilization of the existing transit service.

The developer of Project D, if faced with the decision of implementing the highway design changes versus the transit-related options, would likely select the former. The high annual operating expenses associated with the dial-a-ride system and the transit subsidy program would reduce his existing cash loss position (before ISR) by a factor of 14 percent from a negative $2,879,000 to a negative $3,292,840. Since most of the transit-related costs could not be capitalized, he would realize minimal benefits from the transit option on his profit and loss statement in terms of depreciation and interest expenses.

EXHIBIT III-21
PROJECT D - TRANSIT-RELATED DESIGN CHANGE COSTS

Capital Costs*	
Dial-a-Ride Vehicles (20)	$ 80,000
Dial-a-Ride Promotion	10,000
Carpooling Plan Development	20,000
Subtotal	$110,000

Operating Costs**	
Dial-a-Ride (3,200 trip miles per day @ $.32 per mile for 260 days)	$266,240
Transit Subsidization	145,600
Carpooling Program Maintenance	2,000
Subtotal	$413,840

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*These costs would be covered by loans and amortized over time.

**These costs would be deducted each year on the project's cash flow statement as operating expenses.

5. Project E

a. General Description. Project E is a suburban office park located on the fringes of a rapidly developing American city. The site is serviced by a major expressway and limited mass transit. Sixteen years have been estimated as necessary for completion of the project's 1.5 million square feet of office space.

The developer of Project E operates exclusively in one metropolitan area and so far has limited his developments to office parks. His primary interest is locating office space in suburban areas adjacent to the homes of executives, the developer's key market. Sites must also have good highway access.

Project E fits all of the above criteria while having some additional attractive features. The site selected was large enough to incorporate other than office uses. The developer had learned from prior experience that uses congregating on the fringe of a development can ruin the quality features of that development (e.g., by bringing visual blight and traffic congestion) unless the developer can exercise some degree of control. Conversely, the location of certain uses adjacent to an office park can enhance its attractiveness. For example, restaurants, shops, banks, and movie theatres are logical complements to office facilities and a draw for office tenants if the support commercial activities are well planned and well designed.

Aside from the advantages of a large plot, the developer of Project E was attracted to the site because he was relatively assured of a zoning change. This developer will not follow up on a piece of property without an intuitive feel that the land can be rezoned. He always uses options on the land during zoning negotiations as a safeguard.

Finally, the site had interesting topographical features and was readily adaptable to an office park. The existing vegetative cover would work well aesthetically with low-rise office buildings.

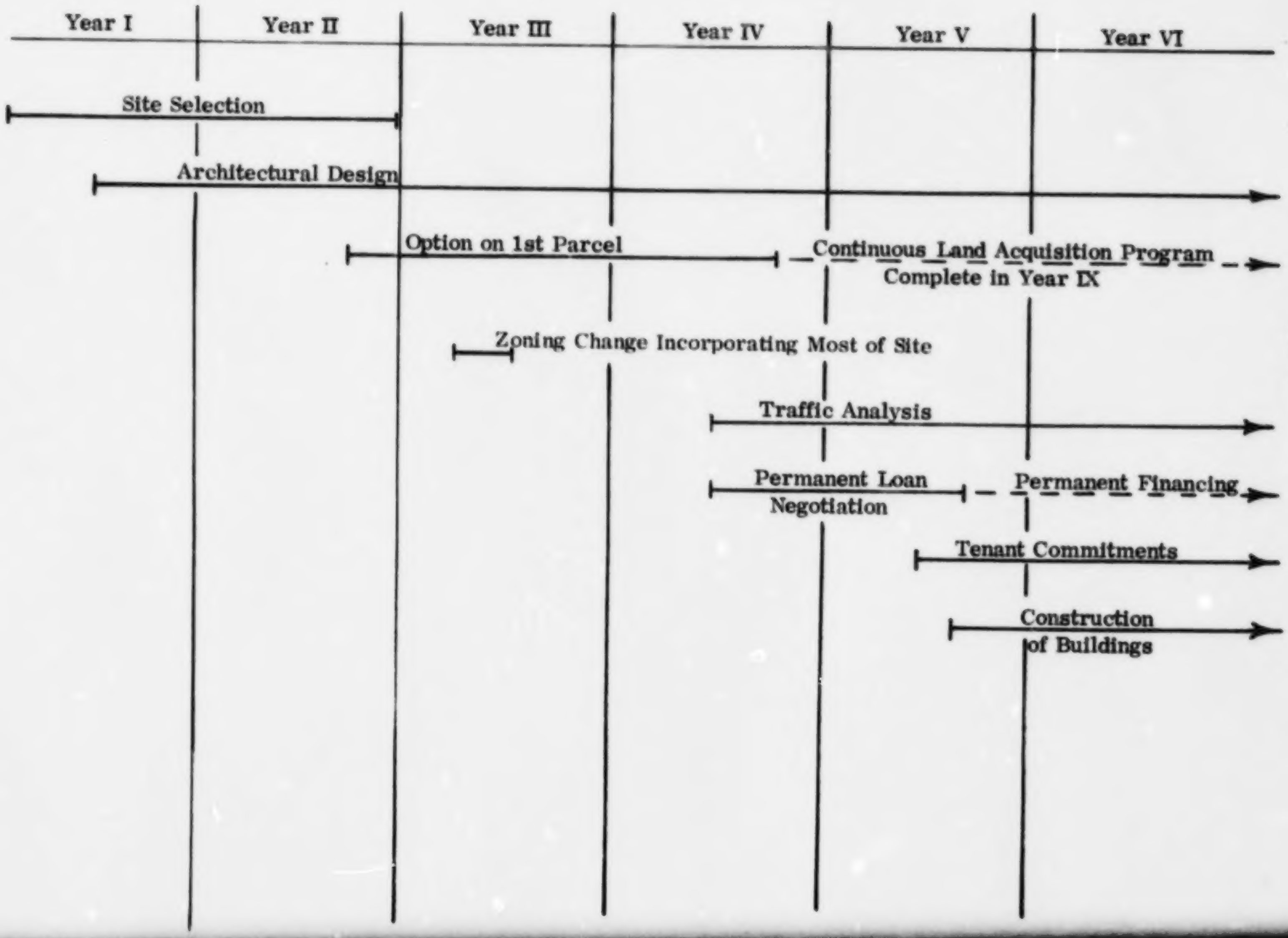
The parking facilities on the site service each building or building complex. The developer allows five spaces per 1,000 square feet of net leasable area although he admits that only a maximum of 4.3 to 4.5 spaces are ever used. No more than 50 spaces are allowed per acre for aesthetic reasons. The developer has sought to blend parking tastefully into the surrounding landscape while conveniently serving the office buildings.

b. Development Process. Project E incorporates several interesting departures from the development decision-making process already described (see Exhibit III-22). To begin with, the developer was sufficiently interested in the land ultimately developed that he retained an architect to prepare preliminary site plans prior to taking an option on the property. Over a year later, a two-year option was obtained on the land and negotiations were started on the zoning change. A plan was submitted in the second quarter of Year III of the project; approval was granted three months later.

Instead of purchasing the land immediately and proceeding with the development process, the developer chose to hold on to his option for the entire two-year period. This creates an interesting contrast to Project A, the other office park, where the development process moved along without a break. A delay in real estate is not unusual, however. Developers may have numerous reasons for holding on to land already zoned through options. They may be awaiting a decline in interest rates or they may be catering to the needs of a major tenant who cannot make a commitment until a future date.

Just prior to the expiration of the land option, toward the end of Year IV, the developer of Project E became actively committed to the project; he commissioned an initial traffic study and he started negotiations for a permanent loan. The tenant for the first building made a commitment in the middle of Year V. The permanent financing became effective one to two months later, simultaneous with groundbreaking.

EXHIBIT III-22
PROJECT E - DEVELOPMENT PROCESS


Year I
Year II
Year III
Year IV
Year V
Year VI
Site Selection
Architectural Design
Option on 1st Parcel
Continuous Land Acquisition Program
Complete in Year IX
Zoning Change Incorporating Most of Site
Traffic Analysis
Permanent Loan
Negotiation
Permanent Financing
Tenant Commitments
Construction
of Buildings

New construction, loans, and tenant commitments have proceeded in piecemeal fashion over the 16-year development period. Some buildings have broken ground with tenant commitments, others without. Financing is handled separately for each building or building complex.

Federal indirect source regulations as currently promulgated would not have affected Project E until Year IX. All buildings constructed prior to that time had total associated parking of less than the 1,000 spaces, as required for review of a new facility in an SMSA. This assumes interpretation for large-scale "phased" developments as presented in the 9 July Federal Register (p. 25293). Thus, the review would probably not have created much of a problem for the developer.

Traffic analyses on Project E have been updated continuously since Year IV. The developer was concerned about traffic congestion and designed the road network on the site to alleviate bottlenecks. He also instituted roadway design changes on the access road to the site at his own expense.

c. Air Quality Findings. This office complex, including more than 6,000 parking spaces, represents one of several developments impacting on the street system in the vicinity of the development. Alone it generates 2.3 vehicles per 1,000 square feet outbound and 0.5 vehicles per 1,000 square feet inbound at peak hours. This unbalanced directional flow at the site represents a minor factor in the flow of traffic on the adjacent major access road; it is the absolute volume of through and turning traffic which creates the congestion.

Access to the site is provided by a six-lane median divided arterial which connects with an interstate highway diamond interchange on one side and a four-lane collector road on the other. Between these boundaries the road intersects with a four-lane arterial and several driveways to developments, including two entrance/exit gates for the office park. Turning movements from the six-lane arterial to the four-lane arterial and to the driveways into the park are accommodated by separate turning lanes, signalization (for left turns only), and channelizing islands. Both entrance/exit gates provide left-turn and right-turn storage and signalized access to the arterial. The distribution of peak-hour traffic between the gates is balanced.

A four-lane ring road provides the major internal circulation at the park. Office buildings with their own separate at-grade parking lots surround this road on both sides. The lots associated with each building or group of buildings represent an overcapacity of spaces, obviating the need to change lots in search of a space.

Use of the EPA methodology indicates critical air quality situations at all three signalized intersections and over free-flow sections of the six-lane arterial and four-lane collector (see Exhibit III-23). Under optimal signal timing, which is within the realm of operation of the vehicle-actuated signals, the six-lane road is in violation of one-hour standards at all signal approaches. A free-flow action from the interchange to the first intersection (with the four-lane arterial) also exceeds one-hour standards. The intersection approach of the four-lane road creates another one-hour violation. Two additional eight-hour violations are indicated at one of the driveway intersections. On the free-flow sections of the collector road which bounds the site on one side, a single one-hour violation exists with two additional eight-hour violations. Neither the interstate highway nor its interchange creates any air quality problems.

Because of the nature of traffic at the office park during the peak hour, the first design change tested was a program of staggered work hours and carpooling.[1] With a cost of $10,000 this program substantially reduced all violations and eliminated violations at the entrance/exit gates to the park. Subsequent design changes which were considered for other areas of potential violation assumed implementation of this program.

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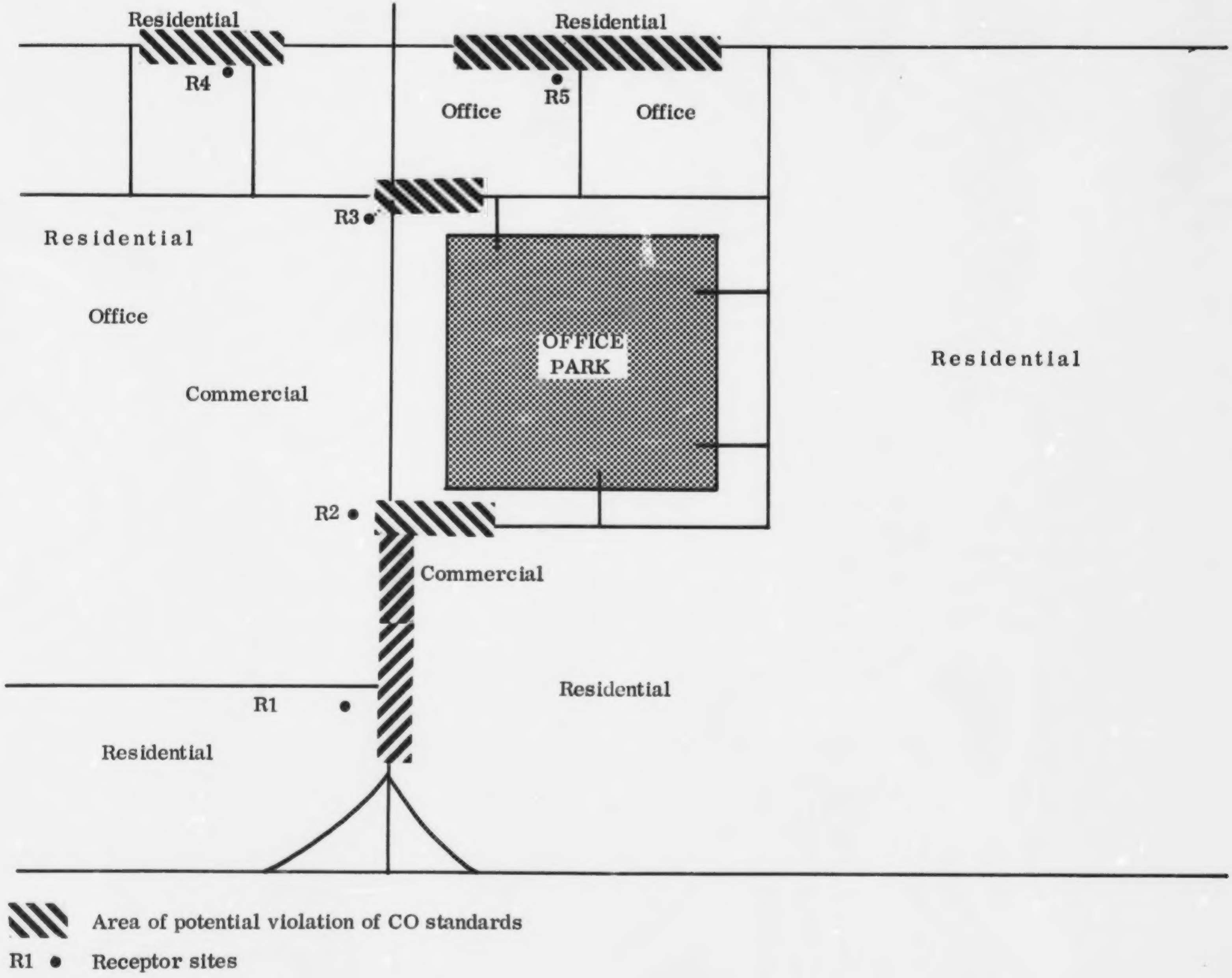
[1] The origin-destination patterns of the office park traffic indicated that work-hour staggering and carpooling could be combined effectively.

EXHIBIT III-23
PROJECT E - SCHEMATIC LAND USE PLAN


Residential
Residential
R4
R5
Office
Office
R3
Residential
Office
OFFICE
PARK
Residential
Commercial
R2
Commercial
Residential
R1
Residential
▨ Area of potential violation of CO standards
R1 ● Receptor sites

The least cost highway related design changes would involve an extra lane for traffic leaving the interchange on an approach to the park and construction of an off-loop at the interchange. Construction of the cloverleaf would require relocation of the existing off-ramp. At a cost of $210,000 these changes would allow traffic to flow uninterrupted on the major arterial bordering the facility.

One section of the collector road which exceeds standards could be brought into compliance at least cost by the addition of one peak-hour lane. Because the flow along this road is directionally unbalanced during the peak period, the extra lane would favor the peak direction with enough through capability to meet the standards. The other violations on this road could be alleviated by adding left-turn storage to segments bordering the park. The cost of these changes would be $134,000.

The transit program proposed as an alternative to these highway design changes consists of a park-and-ride facility located in the vicinity of the interchange. The parking lot would have a capacity of 1,500 cars. Converted school buses would shuttle people back and forth between the lot and the office park. Use of the system would be encouraged by elimination of an equivalent amount of parking within the office park.

As shown on Exhibit III-24, the low cost of this program is a result of the savings in on-site parking lot construction. Because of the particular care the developer takes with the aesthetic characteristic of his projects, the cost per parking space on-site was calculated to be $192 more than at the park-and-ride facility. It was assumed that the developer would still buy the land which was originally planned for parking and use it as a greenbelt.

d. Cost Analysis. ISR occurred in Year IX of Project E's development process. At that time 725,000 square feet of office space were already completed and tenanted with long-term leases in effect. Only the remaining 775,000 square feet could have borne the cost of the review and associated design changes.

EXHIBIT III-24
PROJECT E - TRANSIT OPTION DESIGN CHANGE COSTS

Capital Costs		
Land		
11-Acre Parking Lot	$ 89,500	
3-Lane Access Road (to Lot) (one lane reversible for peak direction)	204,000	
Construction		
Parking Lot	414,750	
Access Road	55,000	
Bus Acquisition*		
(School-Bus Type)	60,000	
Implementation of Staggered Work Hours and Car Pool Program	10,000	
	$833,250	
On-Site Lot Construction Savings	(678,000)	
		$155,250
Annual Operating and Maintenance Costs		
6 Buses with Total of 93 Vehicle Miles per Day @ 81¢/VM for 260 Days	$ 19,600	
		$ 19,600

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*Assumes six buses @ 10,000 each.

Exhibit III-25 illustrates the cost for construction of 775,000 square feet of office space without ISR. Total costs are shown as $24,800,000. The same gross leasable area would generate $0.94 per gross square foot in pre-tax cash flow (see Exhibit III-26).

All costs directly relating to ISR are itemized below for both the highway-related and transit-related design change costs and with and without a 90-day delay:

Capitalized Costs	Highway	Transit
• Design Changes	$354,000	$155,250
• Construction Delay of 3 Months (based on 200,000 square feet representing the only structures where construction timing would have been impacted by review)	86,280	86,280
• No Delay	0	0
• Additional Consulting Fees	5,000	5,000
Subtotal (with delay):	$445,280	$246,530
Subtotal (without delay):	$359,000	$160,250
• Interest @ 12% on Capitalized Costs		
with delay	53,434	29,584
without delay	43,080	19,230
Total Capitalized costs (with delay):	$498,714	$276,114
Total Capitalized costs (without delay):	402,080	179,480
Other Costs (with delay)		
• Interest on Land Loan for Additional 3 Months[1]	2,887	2,887
ISR-Related Costs to Developer		
with delay:	$501,601	$279,001
without delay:	$402,080	$179,480

The transit option would incur $19,600 in annual operating costs in addition to the totals shown above.

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[1] The developer took a land loan to cover the purchase price of much of the project's property after the option on the first parcel had expired. This is an unusual practice. Most developers limit land acquisition to only those acreages which are undergoing immediate development. Ownership on undeveloped land is protected through options.

EXHIBIT III-25
PROJECT E - COST SHEET

Investment Costs*		Without ISR		Highway with ISR		Transit with ISR
			Computer Modeling & 90 Day Delay			
Land						
Construction		$1,438,400		$1,438,400		$1,438,400
Site Work	1,131,229		1,131,229		1,131,229	
Base Buildings	14,395,649		14,481,929		14,481,929	
Tenant Work	2,502,722		2,502,722		2,502,722	
		18,029,600		18,115,880		18,115,880
Design Changes		--		354,000		155,250
Other						
Architectural and Engineering	848,778		848,778		848,778	
Engineering Tests and Survey	39,945		39,945		39,945	
Appraisal	9,663		9,663		9,663	
Commitment and Securing of Construction Loan	469,324		469,324		469,324	
Closing Costs	129,813		129,813		129,813	
Construction Financing (without ISR)	3,065,585		3,065,585		3,065,585	
Overhead and Other Development Costs	599,137		599,137		599,137	
Interior Design	19,971		19,971		19,971	
Landscaping	99,856		99,856		99,856	
Promotion and Contingency	49,928		49,928		49,928	
ISR Prepartion	--		5,000		5,000	
Interest @ 12 percent on Capitalized ISR Costs	--		53,434		29,534	
Interest on Land Loan for Additional Three Months	--		2,887		2,887	
		5,332,000		5,393,321		5,369,471
TOTAL PROJECT COST		$24,800,000		$25,301,601		$25,079,001

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*These figures are based on 775,000 gross square feet of office area constructed from Year IX to the completion of the project. The figures themselves are averages, since more than one building is represented in the 775,000 gross square footage.

Transit with ISR elay		Highway with ISR No Delay		'Transit with ISR No Delay
$1,438,400		$1,438,400		$1,428,400
	1,131,229		1,131,229	
	14, 395,649		14,395,649	
	2,502,722		2,502,722	
18,115,880		18,029,600		18,029,600
155,250		354,000		155,250
	848,778		848,778	
	39,945		39,945	
	9,663		9,663	
	469,324		469,324	
	129,813		129,813	
	3, 065,585		3,065,585	
	599,137		599,137	
	19,971		19,971	
	99,856		99,856	
	49,928		49,928	
	5,000		5,000	
	43,080		19,230	
	--		--	
5,369,471		5,380,080		5,356,230
$25,079,001		$25,202,080		$24,977,480

'he figures

EXHIBIT III-26
PROJECT E - OPERATIONAL CASH FLOW

	Without ISR	Highway With ISR	Transit With ISR	Highway With ISR	Transit With ISR
Income		90-Day Delay		No Delay	
Gross Rent (based on net leasable area)	$4,950,000	$4,950,000	$4,950,000	$4,950,000	$4,950,000
Less Vacancy Allowance @ 5%	(247,500)	(247,500)	(247,500)	(247,500)	(247,500)
Net Rental Income	$4,702,500	$4,702,500	$4,702,500	$4,702,500	$4,702,500
Expense					
Operating Expenses*	(1,670,760)	(1,670,760)	(1,690,360)	(1,670,760)	(1,690,360)
Cash Before Debt Service	$3,031,740	$3,031,740	$3,012,140	$3,031,740	$3,012,140
Debt Service (@ 9.3%)	(2,306,400)	(2,353,049)	(2,332,347)	(2,343,793)	(2,322,906)
Pre-Tax Cash Flow	$ 725,340	$ 678,691	$ 679,793	$ 687,947	$ 689,234
Pre-Tax Cash Flow per Gross Leasable Square Foot	$0.94	$.88	$.88	$.89	$.89

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*Based on inside leasable area and includes operating expenses in the ISR transit option.

When the costs with a three month delay are superimposed on Project E's financial statements as shown in Exhibits III-25 and III-26. Both the highway and the transit design change options would decrease pre-tax cash flow per gross square foot to $0.88. However, the transit option would yield a slightly larger pre-tax cash flow, a difference of about $1,100 annually.

The developer has indicated that the implementation of roadway design changes would have ruined the project's design. All of the project's buildings were purposely set back at least 25 feet from any roadway. Road widenings would have narrowed this distance. It is likely, therefore, that he would choose the transit-related option.

Nevertheless, the developer feels that the design change costs have been understated because they assume developer ownership of the land for the park-and-ride facility. This is true only in part. Land for the parking lot could prove to be very expensive if landowners try to take advantage of the developer's predicament by increasing the price far above the value of the property.

This developer tries to obtain a return of $1.00 per square foot for office space. The reduction from $0.94 per square foot without ISR to $0.88 per square foot with ISR represents a pre-tax revenue loss of $42,000 annually. However, the return with ISR is acceptable to the developer, who indicated that he would most likely proceed with the project.

ISR would not have significantly affected Project E's timing on generating a net positive cash flow return aside from the three-month review delay. The key variable that affects cash flow return over time for an office building is occupancy. The remaining 775,000 square feet represent multiple structures, many of which were commissioned by prospective tenants prior to construction. These tenants would not have been likely to abandon their plans for buildings in Project E because of ISR.

6. Project F

a. General Description. Project F is a five-year modification to convert an existing community shopping center to one of regional scale. Specifically, it involves the addition of three major stores and 2,300 parking spaces, with a 150 percent increase in gross leasable floor area. The facility is located in a suburban area which has been experiencing intensive office and residential development and extensive commercial strip development.

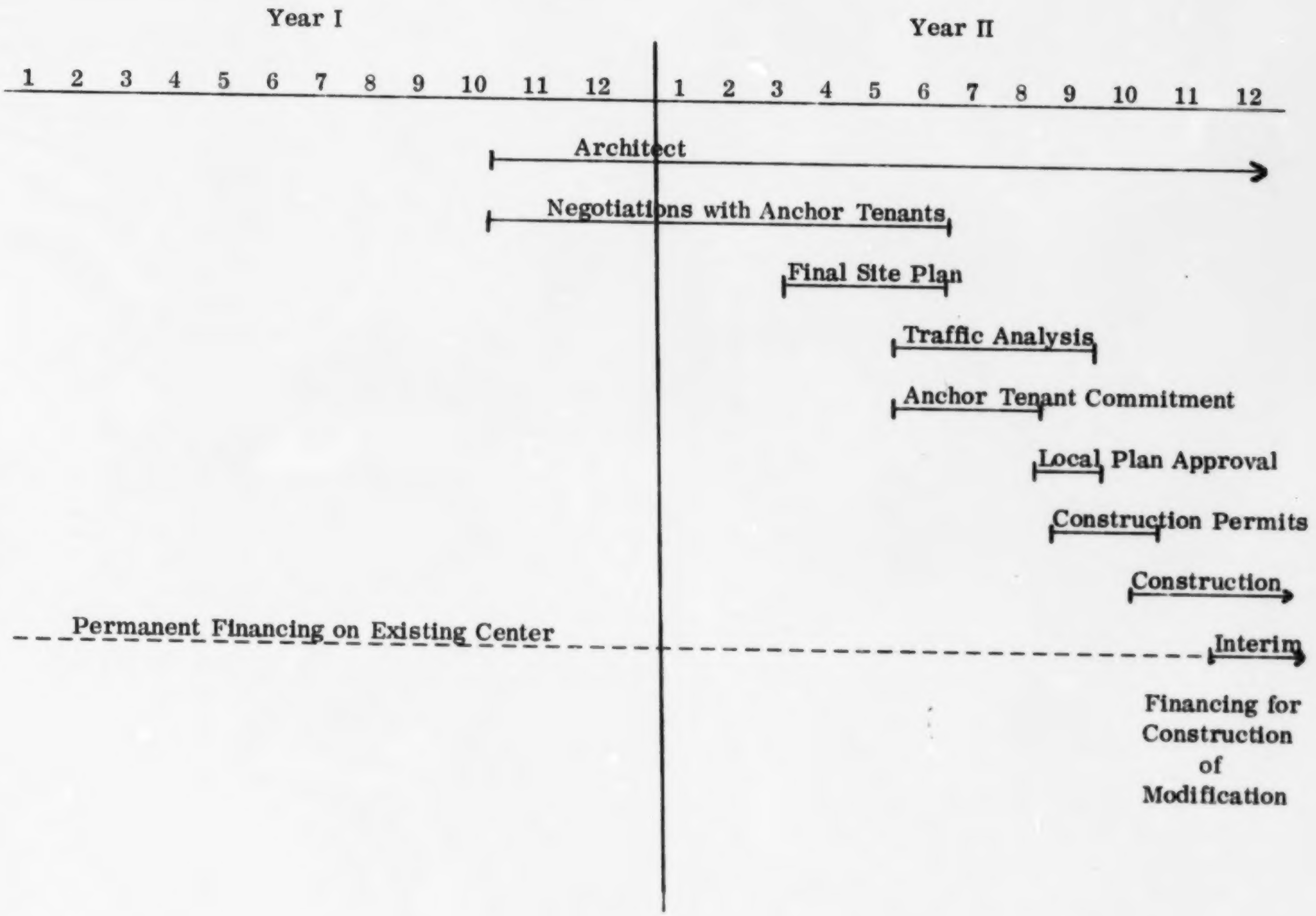
The modification was conceived as part of the phasing program for the original shopping center. One reason the developer committed himself to the expansion was the feeling that he would be concentrating rather than dispersing growth in an area which was experiencing piecemeal sprawl.

The development is serviced by three bus routes. One is a shuttle bus service carrying passengers between this center and another major shopping facility located nearby. It is estimated that 10 percent of the visitors at one facility also visit the other facility on the same day. The shuttle bus is municipally operated and pays for itself. The other two bus routes are major parts of a city-wide transit system. One line has half-hourly service in both directions and travels in and out of the downtown center. The other offers hourly frequencies.

In negotiating with the municipality for final site plan approval on the modification, the developer agreed to set up bus stops on the project site and to contribute to transit system costs. The transit modal split for this development is estimated to be 25 percent.

b. Development Process. The normal development decision-making process for a shopping center modification diverges slightly from that for a new facility (see Exhibit III-27). In the case of Project F, the expansion took place on property which was already owned by the developer and which was appropriately zoned for the development. Market studies had already been performed which supported the additional gross leasable area at the center, and the

EXHIBIT III-27
PROJECT F - DEVELOPMENT PROCESS



existing center was performing well financially. The problem in the case of Project F was to design a site plan which would be attractive to potential department store tenants.

An architect was commissioned toward the end of Year I to draw up a generalized plan. At the same time several major department stores were approached to determine whether they would be interested in locating in the expansion. Not until the middle of Year II was the site plan finalized to the satisfaction of the developer and his first-priority department store tenants. At that time a commitment on the part of all but one of the anchor tenants was also sought.

The front-end expenses related only to the shopping center modification were financed through the loan on the original center. A separate interim loan was negotiated to cover construction costs of the modification. When the modification opened in Year V, the lending institution financing the existing center effectuated a separate permanent loan for the modification.

The site plan for the modification had to undergo local planning approval. The developer was required to approach the planning agency prior to submitting a final site plan in order to settle any differences. Once approval was received, the developer applied for his grading permit. Upon issuance of the permit he began construction. Theoretically, the project would undergo review during Year II after the traffic studies have been completed.

c. Air Quality Findings. Trip generation rates for the expanded center are lower per 1,000 square feet than for the original development. Thirty trips per 1,000 square feet represent an average weekday, with 38 trips per 1,000 square feet on an average Saturday. During the commuter peak hour when the street system around the site is most heavily loaded, entering traffic equals 2.2 vehicles per 1,000 square feet and departing traffic equals 2.0 vehicles per 1,000 square feet.

Primary access to the site is provided by a system of four-lane and six-lane arterials as well as an interstate freeway with two interchanges serving the vicinity of the development. One of these interchanges is within the quarter-mile limit for review. Forty-three percent of approaching shoppers use the freeway; the remainder are fairly evenly divided among the four approach directions.

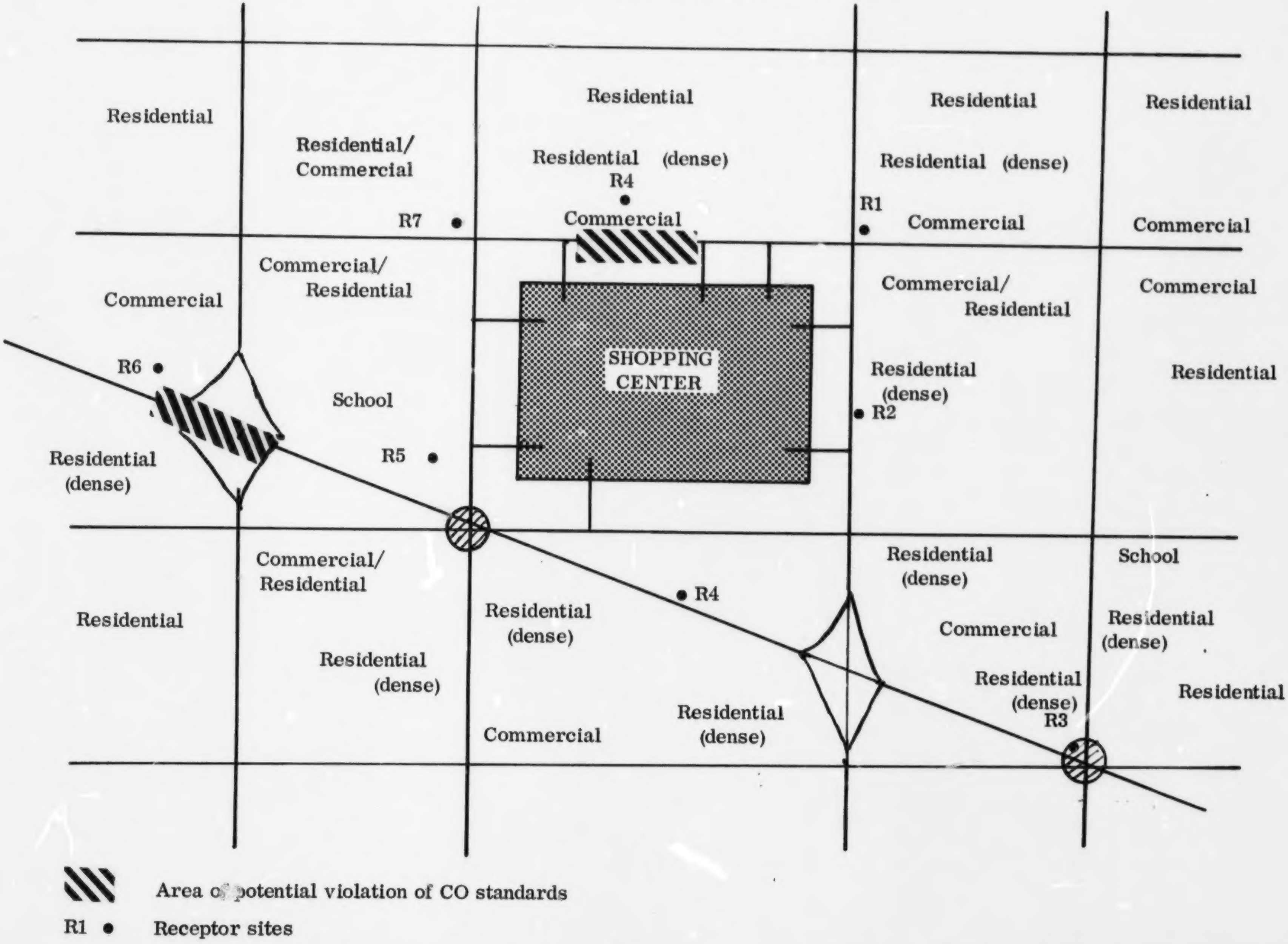
With a few exceptions the roads in the vicinity (including the freeway) peak at 10 percent of average daily traffic with a directional split of 55-45. These characteristics do not create any unusually adverse or unbalanced traffic flows in the area. Prior to modification, three of the arterials bordering the site approached their desirable service volumes. In addition, the arterial providing access to the freeway at the interchange closest to the site has reduced capacity along the overcrossing.

As a result of public interest and comment prior to ISR concerning the ability of the road network to serve the modified facility, the expansion was required to meet several conditions. Traffic flow provisions included road widenings, right-turn lanes, signalization, and a grade separation when volumes require it. The developer had to assume the responsibility and costs for these conditions.

Entrance into the expanded site is provided on four sides. Internal roads allow circulation through the at-grade parking areas that surround the block of buildings in the center. During periods of peak accumulation, finding a parking space could require driving the length and/or width of the center.

Using the EPA methodology to estimate the impact of the modification on air quality, sections of the freeway adjacent to the site represent the major eight-hour violations; a section of one of the bordering roads is also in violation of the eight-hour standard (see Exhibit III-28). There are no one-hour problems. Background levels were assumed to be quite high in the area, based on information from the environmental agency for the city.

EXHIBIT III-28
PROJECT F - SCHEMATIC LAND USE PLAN


Residential
Residential/
Commercial
Residential
Residential (dense)
R4
R7
Commercial
Residential
Residential (dense)
R1
Commercial
Residential
Commercial
Commercial
Commercial/
Residential
SHOPPING
CENTER
Commercial/
Residential
Commercial
R6
School
Residential
(dense)
R2
Residential
Residential
(dense)
R5
Commercial/
Residential
Residential
(dense)
School
R4
Residential
Residential
(dense)
Commercial
Residential
(dense)
Residential
(dense)
Residential
(dense)
R3
Residential
Commercial
Residential
(dense)
Area of potential violation of CO standards
R1
Receptor sites

Least-cost design changes to alleviate the air quality problems on the freeway would involve developing the off-ramp capability at one interchange by increasing the loop radius and adding a de-acceleration lane, at a cost of \$170,000. In addition, an increase in through-lane capability would be required over one section. This could be achieved by adding one through lane, a de-acceleration lane, an acceleration lane, and an off-ramp spur, at a cost of \$700,000. Least-cost improvements to the road bordering the site would require construction of a service road, including right-turn islands at driveway entrances, representing a cost of \$70,000.

Because of the relatively high modal split and the dispersed nature of origins and destinations, transit was not considered an effective alternative in this case.

d. Cost Analysis. Indirect source review was assumed to enter into the development process in Case F during September of Year II when the traffic analysis is completed. The total increase in project costs, including acquisition of land and carrying costs during construction, would be \$3.1 million. The review could create at least a three-month delay, causing construction costs to increase by \$260,000.[1] ISR preparation would add only \$10,000 to costs since the environmental impact report which was prepared duplicates much of what is required by ISR. However, because of the air quality impact of traffic generated by the modified facility, substantial design change costs would be incurred. Increased debt service would add another \$0.2 million.

Financial summary sheets for the modification with and without ISR are shown in Exhibits III-29 and III-30. Land costs for the modification are not included in total project costs because they are part of the investment cost of the original mall.

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[1] This impact could be avoided through proper planning (see Section D, Sensitivity Analysis).

EXHIBIT III-29
PROJECT F - COST SHEET

Investment Costs	Without ISR		With ISR		With ISR	
			Computer Modeling and 90-Day Delay		No Delay	
Land*						
Acquisition of 10 Acres for Design Changes		--		$ 1,700,000		$ 1,700,000
Construction						
On-Site	$8,559,500		$ 8,818,861		$ 8,559,500	
Design Changes	--		940,000		940,000	
		$ 8,559,500		9,758,861		9,499,500
Other						
Grading, Utilities, & Site Finish	$ 1,401,188		$ 1,401,188		$ 1,401,188	
Architectural & Engineering	537,400		537,400		537,400	
Legal	150,000		150,000		150,000	
Environmental Impact Review	75,000		75,000		75,000	
Indirect Source Review	--		10,000		10,000	
Brokerage Commissions	766,300		766,300		766,300	
Promotion Opening & Advertising	65,000		65,000		65,000	
Interest During Construction	1,704,188		1,906,948		1,822,938	
Contingency, Insurance, & Taxes During Construction	453,424		453,424		453,424	
		5,152,500		5,365,260		5,281,250
TOTAL PROJECT COST		$13,712,000		$16,824,121		$16,480,750

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*Land costs for modification are covered by the loan on the original mall.

EXHIBIT III-30

PROJECT F - OPERATIONAL CASH FLOW

		Without ISR		With ISR Computer Modeling and 90 Day Delay		With ISR No Delay
Income						
Rental*		$ 2,271,000		$2,271,000		$ 2,271,000
Expense						
Management	$ 23,500		$ 23,500		$ 23,500	
Maintenance	5,000		5,000		5,000	
Property Tax & Insurance	91,200		91,200		91,200	
Ground Rent	70,000		70,000		70,000	
Miscellaneous	15,000		15,000		15,000	
		(204,700)		(204,700)		(204,700)
Cash Before Debt Service		$ 2,066,300		$ 2,066,300		$ 2,066,300
Debt Service		(1,369,800)		(1,680,730)		(1,646,427)
Pre-Tax Cash Flow		$ 696,500		$ 385,570		$ 419,873
Pre-Tax Cash Flow per Net Leasable Square Foot		$2.51		$1.39		$1.51

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* No allowance for vacany or rent loss.

As shown in the operational cash flow without ISR, the pre-tax cash flow per net leasable square foot equals $2.51. The developer seeks a pre-tax return of $2.00 or more. Consequently, the addition of ISR costs, including a three month delay, would bring the return per net leasable square foot down to $1.39, and would indicate a definite reason for stopping the project.

It is doubtful that the developer would attempt to absorb all of the project's increased costs. Most likely the tenants would be required to bear as much of the burden as possible. It is estimated by the developer that tenants in the area would accept up to an 8 percent rent hike. The operational cash flow with an 8 percent increase in rents is shown in Exhibit III-31.

The pre-tax cash flow per net leasable square foot would increase to $2.05 with the increased rental income with delay-related costs and $2.17 without a delay. These returns exceed the developer's criterion of $2.00 per square foot. Consequently, the project would proceed with increased rents.

A pre-tax cash flow statement over time would not be applicable to this project. The developer was assured of 100 percent occupancy in the first year, thus generating a positive cash flow almost from the center's opening. For many developers a satisfactory return does not guarantee the financial feasibility of a project. Front-end money and the ability to mortgage out at an early date are often the critical factors. In Case F an addition of $10,000 in front-end money for ISR preparation is minimal, about 2 percent of the developer's investment without ISR. This increment would not present a barrier to mortgaging out on schedule.

EXHIBIT III-31
PROJECT F - OPERATIONAL CASH FLOW WITH ISR AND RENT INCREASE

	With 90-Day Delay		With No Delay	
Income				
Rental		$ 2,452,680		$ 2,452,680
Expense				
Management	$ 23,500		$ 23,500	
Maintenance	5,000		5,000	
Property Tax & Insurance	91,200		91,200	
Ground Rent	70,000		70,000	
Miscellaneous	15,000		15,000	
		(204,700)		(204,700)
Cash Before Debt Service		$ 2,247,980		$ 2,247,980
Debt Service		(1,680,730)		(1,646,427)
Pre-Tax Cash Flow		$ 567,250		$ 601,553
Pre-Tax Cash Flow per Net Leasable Square Foot		$2.05		$2.17

D. Sensitivity Analysis

1. Introduction

For a more comprehensive perspective on the cost-related effects of an ISR, this sensitivity analysis categorizes the ISR-related costs into the following groups: application costs, time delay costs, and design change costs. For each group several scenarios are presented in order to gage the full cost impact of an ISR.

2. Application Costs

a. Assumptions

In the case studies in Section C, an application cost of $45,000 was assumed, based upon 10 days of on-site monitoring at four different receptor sites and computer modeling to project the air quality impact of the indirect source. Two of the cases, Projects A and C, were found to have no potential violations of CO standards. With some insight into the factors which lead to the build-up of CO concentrations and a knowledge of the basic traffic, meteorological, and background CO levels for a particular site, it is possible for a developer to anticipate that an area would have limited air quality problems and therefore decide to apply the Technical Guidelines before initiating a modeling effort. If the developer's initial review of the site was correct and use of the Technical Guidelines showed no violations, the developer could stop the analytical portion of the ISR application preparation, eliminating the costs of modeling. Modeling would not be necessary because the Technical Guidelines represent the more conservative approach. This could occur in cases where monitoring is performed by an agency other than the developer. For example, many indirect sources are attracted by new highway construction. In such a case some, if not all, of the monitoring carried out to meet EIS and/or ISR for the roadway project may be used to fulfill the indirect source data needs as well.

Combining the assumptions of the use of the Technical Guidelines rather than modeling and of the elimination of monitoring gives a good approximation of the low end of the range of costs which may be associated with preparing an ISR application.[1]

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[1] The high range of the application costs was not calculated because of the tremendous variation in costs which may arise as a function of the number of receptor sites required, malfunctioning of instruments and/or bad weather which may result in the monitoring period exceeding 10 days, the amount of effort needed to participate in public hearings, respond to public comments, and so forth.

The minimum cost was estimated to be $3,000, based on the following estimates:

●	Data collection and application of the Technical Guidelines	$ 1,000.00
●	Preparation of the ISR application (including formalizing site plans, meetings with public officials, and other ISR-related activities)	$ 2,000.00
		$ 3,000.00

b. Conclusions

Only Projects A and C have been tested for variations in application costs because the determination of no potential violation could be made using the Technical Guidelines, thereby eliminating the need for modeling.

The results of the sensitivity test are shown in Exhibit III-32. In the case of both projects the initial impact and change in level of impact under least cost assumptions are very minimal representing under one-tenth of one precent of the total project costs.

3. Time-Related Costs

a. Assumptions

Two approaches were taken to determine the sensitivity of the case study findings to changes in cost assumptions. The first was to calculate the impact of various delay scenarios on construction scheduling and the second was to examine the same scenarios in terms of opportunity costs.

(1) The Scenarios

The following scenarios were used for the sensitivity analysis:

EXHIBIT III-32
APPLICATION COSTS
SENSITIVITY ANALYSIS

Project A
Total Project Costs

	Without ISR	With ISR Application Costs	
		$45,000	$3,000
Total Cost	$31,425,000	$31,470,000	$31,428,000
Percent Change	--	.14%	.01%

Project C
Total Project Costs

	Without ISR	With ISR Application Costs	
		$5,000[1]	$3,000
Total Cost	$27,750,000	$27,755,000	$27,753,000
Percent Change	--	.02%	.01%

[1] Since public funds were involved in this project an EIS was required, thereby minimizing expenses related to ISR.

- No delay
- A 90-day delay
- A 180-day delay

The "no delay" scenario was designed to represent the case of a developer who anticipates and properly plans for ISR and for whom the review is completed within the allotted period of time. Projects for which the planning phase is just beginning would conceivably fall into this category. Under such a scenario no time-related ISR costs are incurred.

The 90-day delay scenario, on the other hand, represents the situation that faces many developments which are scheduled to break ground over the next one to five years. These projects have gone through the planning and PERT scheduling phases of the development process prior to the promulgation of the ISR regulations. Consequently, these facilities will face a certain amount of unplanned delay time. A 90-day period has been assumed, since this represents the basic period of time required for review, as described in the Federal Regulations (that is, 30 days for preliminary determination, 30 days for public notice and comment, and 30 days for a final decision).

The 90-day delay scenario corresponds to the assumption used in the case studies and is repeated here in the sensitivity analysis for ease of comparison with the alternative delay periods.

All six of the case studies are presented in term of a 90-day delay. Only projects B, D, E, and F are tested under the third scenario or the 180-day delay period. The reason for this is that Projects A and C were found to have no potential CO violation and, therefore, it was assumed that the review in such cases would not require any extensions of the basic 90-day period.

The 180-day period was selected as the maximum delay for the review process, assuming three 30-day extensions to each phase of the review period, pursuant to Federal law. The selection of the 180-day period, however, assumes that only the review period itself is a time burden on the developer and that any efforts related to preparing the ISR application, including monitoring and modeling, can be absorbed into the project schedule without creating any further delays.

(2) The Approaches

The first approach to estimating the time-related costs for a project was to determine the impact of a delay on construction scheduling. For this purpose it was assumed that an unplanned delay in the start of construction would push the completion date an equivalent number of days into the future. It was further assumed that as a result of the delay the total cost of construction would be increased in accordance with projected inflation rates and that additional interest charges would also be accrued as a result of the increased construction costs.[1]

In the case of phased projects, it was further assumed that delays impacting on construction costs would only affect the portion of the facility not erected at the time ISR is initiated.

For this approach, the inflation rates used were set at 12 and 6 percent a year. The 12 percent rate is based on projections by a number of sources (as reported in Engineering News Record) to be the likely rate over the next two years. The six percent rate assumes some change in the national economic picture which would reduce double-digit inflation to a rate closer to historic levels (see Exhibits III-33 and III-34).

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[1] The one exception to this approach was Project E where an addditional cost was added to account for interest on a loan which the developer took out to cover the purchase price of the land after the original option had expired.

EXHIBIT III-33
INFLATIONARY IMPACT ON CONSTRUCTION COSTS DUE TO DELAY
(6% per Year Construction Inflation)

	Time Delay	Time Delay Costs[1]	Percent of Total Project Costs Without ISR	Return on Investment Without ISR	Return on Investment with Delay Costs
Project A	No Delay	0	0	19.1%	19.1%
	90 Days	$ 139,100	0.44%	19.1%	18.9%
Project B	No Delay	0	0	14.2%	14.2%
	90 Days	$ 458,315	1.23%	14.2%	13.7%
	180 Days	$ 916,630	2.46%	14.2%	13.1%
Project C	No Delay	0	0	12.8%	12.8%
	90 Days	$ 233,129	0.84%	12.8%	12.5%
Project D	No Delay	0	0	(3.9%)	(3.9%)
	90 Days	$ 425,700	0.37%	(3.9%)	(4.0%)
	180 Days	$ 851,400	0.75%	(3.9%)	(4.1%)
Project E	No Delay	0	0	21.0%	21.0%
	90 Days	$ 48,317	0.19%	21.0%	20.9%
	180 Days	$ 96,634	0.39%	21.0%	20.8%
Project F	No Delay	0	0	30.3%	30.3%
	90 Days	$ 145,600	1.06%	30.3%	29.7%
	180 Days	$ 291,200	2.12%	30.3%	29.1%

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[1] These costs include the interest on the overall increase in construction costs due to inflation.

EXHIBIT III-34
INFLATIONARY IMPACT ON CONSTRUCTION COSTS DUE TO DELAY
(12% per Year Construction Inflation)

	Time Delay	Time Delay Costs[1]	Percent of Total Project Costs without ISR	Return on Investment without ISR	Return on Investment with Delay Costs
Project A	No Delay	0	0	19.1%	19.1%
	90 Days	$ 278,200	0.89%	19.1%	18.7%
Project B	No Delay	0	0	14.2%	14.2%
	90 Days	$ 916,630	2.46%	14.2%	13.1%
	180 Days	$ 1,815,000	4.88%	14.2%	12.1%
Project C	No Delay	0	0	12.8%	12.8%
	90 Days	$ 466,257	1.68%	12.8%	12.1%
Project D	No Delay	0	0	(3.9%)	(3.9%)
	90 Days	$ 851,400	0.75%	(3.9%)	(4.1%)
	180 Days	$ 1,702,800	1.49%	(3.9%)	(4.3%)
Project E	No Delay	0	0	21.0%	21.0%
	90 Days	$ 96,634	0.39%	21.0%	20.8%
	180 Days	$ 193,267	0.78%	21.0%	20.6%
	No Delay	0	0	30.3%	30.3%
	90 Days	$ 291,200	2.12%	30.3%	29.1%
	180 Days	$ 582,400	4.25%	30.3%	27.9%

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[1] These costs include the interest on the overall increase in construction costs due to delay.

The second approach is to determine the opportunity costs associated with a particular delay scenario. Opportunity costs, a term intrinsic to economists' vocabulary meaning the value of the best alternative, has been calculated for projects B, D, E, and F in an effort to assess the "value" of a delay due to ISR. In these cases the yield for the alternative to tying up the developer's front-end investment money for a specific period of time was made equivalent to the actual rate of return for the case study project. Although, the rates of returns experienced by developers are relatively high compared to other types of investment, at the time an ISR delay may conceivably occur, the front-end investment is relatively low (see Exhibit III-35).

(3) Conclusions

Anticipating a certain amount of time for the review process so that no delay-related costs are incurred, is a responsibility that developers should begin to undertaks as soon as possible

During the first few years that the regulations are in effect, however, many projects will be too far along to permit ISR timing to be readily absorbed and delay-related costs may occur.

The sensitivity analysis shows that if the rate of inflation dropped from 12 percent to 6 percent, the variation in return on investment with and without ISR is as follows:

	12% inflation	6% inflation
90 - days	0.2% - 1.1%	0.1% - 0.6%
180 - days	0.4% - 2.4%	0.2% - 1.2%

The six case study projects are fairly evenly distributed over these ranges. Three experience impacts at the low end of these ranges and three experience impacts at the high end.

In terms of opportunity costs, developers would experience an increase of anywhere from 3.5% to 7.5% for a 90-day delay and 7.0% to 15.0% for a 180-day delay on their front-end investment. Although its role in the development process makes front-end investment valuable, the absolute dollar figures are relatively small (e.g. a range of $11,034 - $52,264 for a 90-day delay and $22,068 - 104,528 for a 180-day delay.)

EXHIBIT III-35

ISR TIME DELAYS MEASURED IN OPPORTUNITY COSTS

Project		Front-End Investment	Developer's Rate of Return Without ISR	90-Day Impact		180-Day Impact	
				$	% of Total Investment	$	% of Total Investment
B	(1)	$1,345,000	14.2%	$47,075	3.5%	$94,150	7.0%
	(2)	407,000	"	14,245	"	28,490	"
D	(1)	$1,504,000	(3.9%)	$52,264	3.475%	$104,528	6.95%
	(2)	1,179,820	"	40,999	"	81,997	"
E	(1)	$ 653,681	21.0%	$34,318	5.25%	$ 68,637	10.5%
	(2)	255,887	"	13,434	"	26,868	"
F	(1)	$ 258,740	30.3%	$19,406	7.5%	$ 38,811	15.0%
	(2)	147,120	"	11,034	"	22,068	"

(1) Estimate of front-end envestment based on 10 percent of total architectural engineering fees; 80 percent of legal fees; 10 percent of land costs; and the percent of project management costs that front-end investment period is of total project period.

(2) Estimate of front-end investment, equal to 1 percent of total project costs with ISR.

4. Design Change Costs

Several probable situations relating to public assumption of design change costs have been examined in the sensitivity analysis.

a. Incidence of Costs

- Highway Design Changes. Design change costs for projects B, D, E, and F, which are those projects that may require highway design changes, have been calculated for the following cases (see Exhibit III-36).
  - --Developer supports all capital investment of highway design changes; maintenance is supported by the public sector, since highway change was dedicated to it by the developer. This is what has been assumed in the preparation of the "with ISR" cost sheets.[1]
  - --Developer assumes only the local share of capital investment for changes on roadways eligible for Federal or state sharing programs. Maintenance is assumed by the public.
  - --Public supports all capital investment for highway design changes. However, the developer while waiting for the highway design changes supports an interim transit system. This interim waiting period has been assumed to be one year.
- Transit Design Changes. Such design changes were alternatives considered in projects D and E; hence, for only these two projects total cost impacts for the following cases were presented:
  - --All capital investment and maintenance of transit design changes are supported by the developer.
  - --Developer supplies local share of capital investment for transit equipment assuming Federal assistance; public assumes operating and maintenance expenses.

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[1] In examining the impact of design change costs, it should be remembered that sometimes developers incur design change costs for other reasons as in response to a directive from a zoning board or city planning department.

EXHIBIT III-36
INCIDENCE OF DESIGN CHANGE COSTS AS USED IN SENSTIVITY ANALYSIS

PROJECT		Highway Case 1	Highway Case 2	Highway Case 3	Transit Case I	Transit Case II	Transit Case III	Transit Case IV
B	C	1,653,000	287,840	000	——	——	——	——
	O + M	000	000	000	——	——	——	——
D	C	1,587,300	1,587,000	33,000	121,000	50,600	33,000	33,000
	O + M	000	000	498,000	413,840	000	413,840	147,600
E	C	396,480	151,200	12,200	173,880	120,120	106,680	106,680
	O + M	000	000	240,000	19,600	000	19,600	000
F	C	2,756,842	1,964,700	000	——	——	——	——
	O + M	000	000	000	——	——	——	——

C = Capital Investment Cost
O + M = Operating and Maintenance Cost

Highway*

Case 1. Developer bears full capital investment cost. The public assumes maintenance costs of highway.

Case 2. Developer assumes the capital investment cost of design changes involving local roads. The public assumes the remaining capital investment and all maintenance costs.

Case 3. Developer assumes all capital costs as well as operating and maintenance costs of an interim transit system set up to service the facility between its opening and completion of permanent design changes. The public bears capital and maintenance costs of the permanent changes.

Transit*

Case I. The developer bears full capital and operating and maintenance costs for design changes.

Case II. The public assumes 80 percent of transit equipment costs. The developer assumes the remaining capital costs and operating and maintenance costs.

Case III. The public assumes all transit equipment costs and the developer assumes remaining capital costs and operating and maintenance costs.

Case IV. The public assumes capital and maintenance costs.

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*Carpooling and work staggering program costs were assumed by the developer in all cases. All capital costs include short-term interest charges.

--Public assumes all capital investment expenditures for transit equipment; developer assumes operating and maintenance costs. This is a likely alternative since often there are public funds available for capital investment expenditures on public transit equipment, but no funds available for operation and maintenance.

--Public assumes all costs, capital investment, and operation and maintenance.

Other assumptions include the following:

- Interest will vary with each case taken. Total interest on construction during the project is computed as the interest at the financial constant of the project on the sum of the on-site construction costs plus the developer's share of the highway design change cost (or interim transit option) required to meet air quality standards.
- The interim transit option open to the developer, while the public takes on all highway design change costs, will be assumed to be in operation for a one-year period. For an office park, operation of transit vehicles will be over 260 days; for a shopping center or mixed land use development, 365 days of use are assumed.
- Vehicles for the interim transit option are assumed to be leased in the more economical way open to the developer--as opposed to purchasing vehicles for only one year and having all the associated operating and maintenance costs.

b. Impact of Emission Controls on Design Changes. Exhibit III-37 shows the increasing rates of emission controls on automobiles over time and the impact that this can have on the number and magnitude of design changes required under ISR. The CO violation identified in each of the case studies

EXHIBIT III-37
DESIGN CHANGE COSTS[1]
The Impact of Automobile Emission Control Devices on Design Change Costs Over Time

	Highway - Related			Transit - Related[2]		
	1980	1985	1990	1980	1985	1990
Case B	$1,250,000	$1,250,000	$1,167,000	**	**	**
Percent of base year cost	92%	92%	86%			
Case D	$539,000	$132,000	$000	$90,000	$20,000	$000
Percent of base year cost	37%	9%	0%	82%	18%	0%
Case E	$354,000	$40,000	$40,000	$155,250	$40,000	$40,000
Percent of base year cost	40%	11%	11%	40%	26%	26%
Case F	$300,000	$200,000	$000	**	**	**
Percent of base year cost	32%	21%	0%			

** Transit ridership already at maximum reasonable volume.
Work staggering and carpooling not applicable.

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[1] Costs in constant dollars based on original completion date (base year) by project.

[2] Costs do not include annual operating costs.

were based on a 1975 completion. In order to determine whether the developer of each project might decide to delay construction in order to take advantage of motor vehicle emission controls, each violation was recalculated assuming the completion date would be delayed to 1980, 1985, and 1990. The adjustment factors used to reflect the application of national CO emission control programs are shown below.[1]

1980	.41
1985	.32
1990	.21

Because the adjustment factors represent the national age mix of automobiles, they may not reflect an individual state's or region's age mix. When further refinement of these adjustment factors is possible, those refinements should be used in preference to the national adjustment figures.

For comparison purposes the costs shown in Exhibit III-37 are represented in constant dollars.

c. Conclusion. Under alternative incidence assumptions design change costs range from less than one percent to 21.6 percent of total project costs without ISR. The negative impact on return on investment ranges from zero to 10.4 percentage points. The two permanent transit options tested show a negative return on investment towards the low end of this range, 0.5 to 1.4 percentage points. Interim transit, in the two projects which offered this alternative, proved to have a worse impact on the developer's return on investment than did full developer assumption of permanent highway changes because of the high operating costs associated with the interim options.

The impact of automobile emission control devices over time reduced design change costs to zero in two out of four cases by the year 1990. In 1985 design change costs, as a percentage of the base year costs, range from 9 to

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[1] Environmental Protection Agency, Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality, Research Triangle Park, North Carolina, July 1974.

92 percent. The same figures for 1980 show a range from 32 to 92 percent. The one case in which design change costs did not decrease substantially in any of the three years represents a downtown shopping center located in the vicinity of heavy auto commuter traffic.

E. State and Local Experience with ISR-Related Costs

The purpose of this section is to determine whether costs similar in magnitude to those projected in the case studies have actually been experienced in areas with ongoing review procedures. Thus, findings concerning ISR-related costs in Oregon, Florida, and Philadelphia will be presented. Additional information gathered from discussions held with a number of different developers and lenders has been included.

1. ISR Application Costs

Experience relevant to Federal ISR preparation costs can be drawn from the Florida experience. Florida has the longest record of experience with an ISR review process that meets all aspects of EPA requirements. Discussions with developers actively engaged in projects in the state have provided many examples of costs associated with the application process. Costs cited for analyzing CO concentrations for new developments--both with and without monitoring--have ranged from $5,000 to $65,000.

Unfortunately neither the Oregon nor the Philadelphia experience provides reasonable checks on the costs cited in Florida. The Oregon process has been dominated by small (less than 500 spaces) developments for which review has been perfunctory when compared to Federal ISR procedures. Large developments of ISR magnitude in Oregon are required to prepare environmental impact statements covering noise and water in addition to air quality. The expense of this preparation cannot be compared, or broken down for comparison purposes, with Federal ISR preparation costs.

A similar situation is found in Philadelphia. This is due to the fact that, to date, only projects with public involvement have come up for review. Such projects are already responsible for EIS, pursuant to NEPA requirements. Money is allocated from the outset for environmental analyses. Again, the costs attributable to air quality analysis cannot be broken out.

Conversations with developers and lenders have indicated time and again that ISR preparation costs, according to Federal requirements, do not pose a serious financial concern. The reason often cited for the lower level of concern associated with ISR preparation is the ability to ascertain the relative magnitude of costs associated with preparation. Contingencies are relatively minimal in the application procedure.

2. Time-related Costs

Florida again provides the most relevant example for comparing the delay costs inputed in the case study to actual costs experienced by developers. Time delay under ISR review in Florida has been cited as resulting in costs ranging from $500 to $25,000 per day. Figures within the higher range of the cost spectrum include opportunity costs. Another reason for the wide range is the mixture of fixed and variable costs which are factors in time delay quantification. The proportions will vary with the size of a project and the number of cost elements impacted by delay. The costs were primarily due to problems in initiating a new program, including a longer review period and the incidence of ISR at a fairly late point in the development process.

Oregon, with its proliferation of small developments, does not provide representative examples of the magnitude of delay costs that may be experienced under Federal ISR. The experience of one large developer, however, illustrates the major impact that ISR can have on development in Oregon. Currently, ISR has caused a delay of more than one year in the construction of a large regional shopping center. This delay has resulted in an estimated 20 percent or $3 million increase in construction costs and an additional $1.4 million increase in interim and permanent financing due to a rise in the financing constant (from 9.0 to 9.5 over the period of a year. Spreading the $4.4 million total over a year yields approximately $12,000 per day for comparison with the Florida experience. Under the Federal regulations a delay of a duration equivalent to the Oregon case would not be experienced, since the maximum period is 180 days, unless the timing of the review results in a project being postponed until the start of a new construction season.

Philadelphia, again, provides no insight into the magnitude of delay costs that may be experienced by private developers. Public projects, such as the ones reviewed to date in Philadelphia, incorporate flexible schedules not possible in the private sector. Interest rate increases are of limited concern in public investments. Construction cost increases due to delay cannot be attributed to the review process because of the multiple and overlapping delays involved in implementation of public projects.

Time delays were viewed as critical by the developers and lenders interviewed. The concensus was that delays could not only significantly increase carrying costs, but might also force a project into the next construction season or result in losses of options, failure to meet commitments to tenants, and the like.

3. Design Change Costs

Evidence from Florida indicates that some developments have incurred major design change costs, although there is often some uncertainty as to whether to attribute these costs to ISR or DRI.[1] For example, in some cases DRI approval might be conditional upon a statement from a DOT official that he has reviewed existing and projected traffic flows for the roadnet surrounding a proposed development and that the developer has agreed to make any DOT-suggested changes necessary to maintain suitable roadway level-of-service characteristics. From experience to date, such DOT assessments could require a developer to pay from $0.25 million to $1 million to make the specified roadway improvements. Although these costs are originally attributable to DRI, they might also serve as design changes appropriate to receiving ISR approval. Therefore, such costs might be considered in part related to DRI and in part to ISR.

In general, persons interviewed during the course of the study of the Florida experience seem to feel that design change costs--whether for ISR or DRI--may average less than might be experienced in other states because the ambient air quality in Florida is relatively good. This means that the potential for new development to exceed NAAQS is more limited than elsewhere, as is the need to institute design changes to prevent violation of CO standards.

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[1] A comparison of ISR and DRI (review of developments of regional impact) is presented in Appendix E.

Both the large and the small developers in Oregon seem to benefit from the fact that, to date, design change requirements have focused largely on transit improvements and parking space reductions. Relatively minor street modifications are sometimes included in the conditions but major changes are not. The implication of the review process in the past, whether intentional or not, has been to utilize developers as a means of speeding up transit improvements which are consistent with PMP (Parking Management Programs) and TCP (Transportation Control Plans).

The costs of transit-oriented changes can be significantly less than fully highway-oriented changes. In one case, an initial outlay of $325,000 was required for buses, subsidies to the public transit system, and minor changes in the roadnet, with operating costs of $150,000. This compares to a million dollars or more for one major roadway change (e.g., constructing an overpass). However, counts at the facility showed that less than one percent of visitors used the transit provided and that most patrons continued to drive, despite a reduction in the number of on-site parking spaces. Consequently, questions are raised regarding the effectiveness of transit as an "effective" design change option. Oregon DEQ attributes the failure of the transit system at this facility to the attitude of people there toward mass transit, the convenience associated with automobiles, and the overall inability of the area's population density to support a transit system.

Design changes subsequent to review have not been required in Philadelphia. Throughout the planning period, designs are carefully monitored by several agencies because of the public nature of the projects which have come up for review. This process has prevented the imposition of additional design changes as a result of ISR.

Design change costs, per se, have not been acknowledged as a major concern by the developers and lenders interviewed. These costs represent a quantifiable magnitude which they have indicated is of less concern than uncertainty associated with delay costs.

F. Conclusions

Certain conclusions concerning the economic impact of ISR on regional shopping centers, office complexes, and mixed-use developments may be drawn as a result of the analyses performed during the six cases studies as well as certain information drawn from the state and local experience studies described in the preceding pages. The findings of the case study and sensitivity analyses are shown in Exhibit III-38 and III-39. The conclusions are presented below.

1. Data Acquisition and ISR Application Preparation Costs

The case studies show that the cost incurred by a developer in collecting and analyzing traffic and air quality data to determine a project's impact on localized concentrations of CO are minimal and may be readily absorbed. Findings show these costs to be generally less than one-tenth of one percent of total project costs. The use of the Technical Guidelines can significantly reduce the costs associated with data acquisition and preparation of an ISR application. For example, in the sensitivity analysis assuming the use of the Technical Guidelines rather than computer modeling and assuming monitoring data supplied by a public agency, ISR application costs were estimated to be reduced from $45,000 to $3,000.

Since the methodology presented in the Guidelines is based upon conservative technical assumptions it is highly probable that where multimillion dollar investments are involved, developers will prefer to rely on more expensive monitoring and modeling techniques--particularly for making specific determinations on the nature and extent of design change needs. The Guidelines will probably be most important for developers of small-scale projects, who have limited sources of funds for front-end investment.[1]

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[1] Although small-scale projects are not addressed in the case studies, such developments may come under review as the result of being sited in a TCP area or in a locality which requires indirect source review for developments with fewer parking spaces than specified under the triggering limits for Federal ISR.

EXHIBIT III-38

SUMMARY OF SIX CASE STUDY ANALYSES

		TOTAL COSTS			RETURN ON INVESTMENT		
		WITHOUT ISR	WITH ISR No Delay	WITH ISR 90 Day Delay *	WITHOUT ISR	WITH ISR No Delay	WITH ISR 90 Day Delay *
Office Park							
	Project A	$31,425,000	$31,428,215	$31,749,222	19.1%	19.1%	18.6%
	Project E	24,798,000	25,202,080 (H)** 24,977,480 (T)	25,301,601 (H) 25,079,001 (T)	21.0%	20.2% (H) 20.3% (T)	20.0% (H) 20.1% (T)
Shopping Center							
	Project B	37,200,000	38,892,000	39,811,300	14.2%	12.2%	11.3%
	Project F	13,712,000	16,480,750	16,824,121	30.3%	20.2% 24.6% ***	19.2% 23.5% ***
Mixed Use							
	Project C	27,750,000	27,753,000	28,221,757	12.8%	12.8%	12.1%
	Project D	113,982.000	115,613,300	116,464,700	(3.9%)	(4.2%)	(4.4%)

* Inflation rate of 1 percent per month

** H = Highway Design Change
T = Transit Design Change

*** With an 8 percent increase in rents

EXHIBIT III-39

SUMMARY OF ISR RELAT
(DOLLARS)

	Application Related Costs		Design Change Related			
			Highway			Mass Tra
	Technical Guidelines	Computer Modeling	Case 1	Case 2	Case 3	Case 4
Office Park						
Project A	$3,000	$45,000	0	0	0	0
Project E	-	$ 5,000	$396,480	$ 151,200	$252,200	$193,480
Shopping Center						
Project B	-	$35,000	$1,653,000	$ 287,840	0	0
Project F	-	$10,000	$2,756,842	$1,964,700	0	0
Mixed Use						
Project C	$3,000	$ 5,000	0	0	0	0
Project D	-	$ 40,000	$1,587,300	$1,587,300	$531,000	$413,961

Highway

Case 1. Developer bears full capital investment cost. The public assumes maintenance costs of highway.

Case 2. Developer assumes the capital investment cost of design changes involving local roads. The public assumes the remaining capital investment and all maintenance costs.

Case 3. Developer assumes all capital costs as well as operating and maintenance costs of an interim transit system set up to service the facility between its opening and completion of permanent design changes. The public bears capital and maintenance costs of the permanent changes.

Transit*

Case 4. The developer bears full capital and operating and maintenance costs for design changes.

Case 5. The public assumes 80 percent of transit equipment costs. The developer assumes the remaining capital costs and operating and maintenance costs.

Case 6. The public assumes all transit equipment costs and the developer assumes remaining capital costs and operating and maintenance costs.

Case 7. The public assumes capital and maintenance costs.

*Carpooling and work staggering program costs were assumed by the developer in all cases. All capital costs include short-term interest charges.

				Delay Costs			
				90 Days		180 Days	
5	Case 6	Case 7	No Delay	6% Inflation per year	12% Inflation per year	6% Inflation per year	12% Inflation per year
	0	0	0	$ 139,100	$ 278,200	-	-
,120	$126,280	$106,680	0	$ 48,317	$ 96,634	$ 96,634	$ 193,267
	0	0	0	$ 458,315	$ 916,630	$ 916,630	$ 1,815,000
	0	0	0	$ 145,600	$ 291,200	$ 291,200	$ 582,400
	0	0	0	$ 233,129	$ 466,257	-	-
00	$446,840	$180,600	0	$ 425,700	$ 851,400	$ 851,400	$ 1,702,800

2. Delay Costs

Over approximately the next two to five years, there is a strong possibility that delay costs may be a fairly significant source of ISR-related economic impact on the three types of developments analyzed in the case studies, although depending on the length of the delay involved, probably not as significant as may be anticipated by some members of the development industry. The projected short-term nature of the impact is due to the fact that many of the projects which will come up for review during the early years of the ISR program have already gone through several years of planning, PERT scheduling, and other steps in the development process which limit the developers flexibility in absorbing time delays. In addition, time-related costs may be incurred in part because delays are much more common during the initial phase of implementing a new set of regulations and in part to a combination of economic factors, including tight money supply, inflation, construction material shortages, and so forth. The uncertainty associated with delays rather than absolute cost gives added importance to this type of impact.

There are two sources of delay which have been examined in the case study evaluation: delay due to the length of the review process and delay due to implementing design changes. Regarding delays due to the length of the review process, findings of the case studies and sensitivity analyses indicate that there is a wide variation in impact, depending on the particular development. In terms of impact due to inflationary increases in project costs with a delay in the start of construction, three of the six projects showed changes of around one-half of a percent in ROI, while three projects showed about a 1 to 7 percent drop for each 90-day increment in ROI in time cost. Opportunity costs as a measure of delay also vary widely, showing, for example, a range of from 3.5 to 15 percent of front-end investment for the six case studies under assumptions of 90 and 180-day delay periods.

Delays due to the need to implement design changes, however, raise a different set of questions. Timing can be an especially critical problem when a project is postponed altogether until the necessary roadway or transit improvement has been made. Economic impact of this type may be minimized by instituting interim measures which can be used to protect an area from violation of NAAQS for CO until such time as a permanent design change is implemented. An example of this would be to allow an ISR permit to be issued for a development if a shuttle bus system is maintained by the developer until off-site roadway changes have been made.

3. Cost of Design Changes

Over both the short and long term, the cost of design changes may be the major source of economic impact stemming from ISR. The case studies indicate that developments in downtown or densely populated areas will be most affected by this type of cost. In addition, the studies show that regional shopping centers probably face the most significant design change costs due to the nature of the traffic generated by such facilities.

Two of the four case studies requiring design changes represent urban shopping centers. Both of these facilities showed substantially greater design change costs as a percentage of total project costs than the remaining facilities in violation of NAAQS. The range of developer costs, under alternative incidence assumptions for the shopping centers equalled 0.7 to 21.6 percent of total project costs without other ISR-related costs, while the mixed use and office developments showed a range from 0.3 to 1.6 percent of total project costs without other ISR-related costs.

Design change costs can be minimized to the degree that the incidence of the costs can be shared between public and private sources.

As a percent of total project costs, the spread between full developer responsibility for costs and least developer responsibility for capital cost ranges from 0.07 to 3.7 percentage points.

Under alternative incidence assumptions the negative impact on the developer's return on investment ranges from zero to 10.4 percentage points. The two permanent transit options tested show a negative impact on return on investment towards the low end of this range, 0.5 to 1.4 percentage points. However, the interim transit program, tested in the same two cases, proved to have a worse impact on the developer's return on investment than did full developer assumption of permanent highway changes. Consequently interim design changes will probably only be used to enable developers to obtain financing for the total project during delays in permanant design change implementation.

The impact of automobile emission control devices on design change costs over time proved substantial in three of the four projects. Two projects required no design changes by the year 1990. However, in the fourth project, 86 percent of orignial design change costs would be incurred in 1990.

The persistence of the air quality problem necessitating these substantial design change costs so far into the future can be attributed to the fact that the facility represents a regional shopping center located downtown in the vicinity of heavy auto commuter traffic. This facility, in particular, indicates the desirability of examining the issue of whether, from an environmental perspective, the size or location of the project is indeed suitable for the area under consideration. Questions related to size and location are examined more fully in Part IV of this report.

4. Financial Feasibility and ISR-related Costs

In the real estate development industry the financial characteristics and feasibility criteria for specific projects vary widely, as illustrated by the six case studies described in this section. Consequently, ISR impact also varies widely. In addition, the magnitude of ISR-related costs can change significantly depending on such factors as timing (both point in time and duration of time), the year in which the review takes place, the type of activity and location, the methodology used to assess air quality, and so forth. The sensitivity analysis in Section III-D provides examples of the differentials in impact associated with these and other factors.

With regard to the six cases, under varying cost assumptions in only one instance did the financial feasibility of a project seem jeopardized due to ISR. One of the two regional shopping centers studied, Project B, was a marginal project even before incurring any additional costs. As a result of the type of traffic attracted and the facility's location in a congested area with very high levels of carbon monoxide concentration, a number of relatively costly design changes would be needed to meet the regulations. Even with public assumption of a large percentage of the design change costs, the financial feasibility would be in question especially since tenant stores were already paying rents well above normal, so that a rate increase could not be considered. In the case of Project B, therefore, the development could only proceed under ISR if it was relocated or in some way redefined to service a transit-oriented market.

The second shopping center analyzed, Project F, stands in striking contrast to the case described above. Project F is a modification to an existing shopping center. Again, as in the case of Project B, design change costs were high; in fact, the total design change costs for the modification are higher than for any of the other six cases. Unlike Project B, however, the developer estimated that for this development a rent increase of up to eight percent would be possible. With this increase in revenues, the additional ISR-related costs could be absorbed, and the developer could achieve his feasibility criterion for the project of a $2.00 cash flow per net leaseable square foot.

In the case of the two office parks, Project A causes no violation of standards, so that ISR-related costs are minimal. If the Technical Guidelines are used instead of monitoring and computer modeling and no delay costs are incurred, total costs would probably not exceed $3,000. The location of the office park in a largely rural, although developing area was an important factor in minimizing the impact of the facility on ambient air quality.

The second office park, Project E, does create violations of NAAQS for carbon monoxide during peak rush hours. Due to the type of facility, a combination of staggered work hours, carpooling, and a park and ride system was found to be a less costly design change alternative for the developer than a combination highway-related change. Under ISR this project could still be financially feasible, even if the park and ride system is supported solely by the developer. Furthermore, savings may be possible if surrounding facilities participate in the park and ride program on a cost share basis and/or the need to construct on-site parking spaces for employees is reduced.

Of the two mixed use developments, the analysis shows that the traffic generated by Project C does not cause standards to be exceeded. Careful planning to ensure smooth traffic flow is the key factor in the case of this development. As with Project A, ISR-related costs would probably be minor, since no design changes would be needed to obtain an ISR permit.

Project D, the second mixed use development, is located in a densely populated urban fringe area, where there are numerous points of traffic congestion. The air quality analysis indicates that NAAQS can be exceeded at these points and that a large number of ISR-related design changes would be required. The mix of uses within this project results in carpooling and staggered work hours having relatively little impact, compared to the office park described under Project E. Although a transit option is available, the highway design changes would probably be preferred by the developer, since they are slightly less costly in this instance. The impact of ISR-related costs on the project's feasibility is different than in the other five cases. The development has a negative cash flow and is being used as a tax shelter by a diversified corporation that must assess the project in terms of the financial status of its other activities, as well as the ultimate effect of the financial changes on stockholders.

PART IV
ISR IMPACT ON THE LOCATION AND SIZE OF DEVELOPMENT

A. Overview

Part II of this report presented a number of public comments related to the promulgation of the proposed EPA indirect source regulations. Many of these comments reflected concern that developers would respond to the regulations by either reducing the size of their planned facilities below the triggering points for review or that they would locate in areas with relatively clean air in order to limit the possibility of violating NAAQS for CO. The commentators considered both of these alternatives environmentally undesirable, noting that they would create an impetus for continued urban sprawl and more automobile travel--a situation which, in turn, would ultimately lead to a higher level of pollution from photochemical oxidants.

A different but related set of comments raised the issue of whether the proposed regulations would result in air quality being the sole determinant used in land use decisions. In response to this criticism, the EPA administrator issued the following statement:

> It should be emphasized . . . that the determination made pursuant to these regulations is only one necessary step among many other land use measures already generally established (i.e., zoning approval, site plan approval, demolition and building permit approval, sewer tap-in approval, etc.) in order to assure that a specific facility will be designed and located in a manner not inconsistent with the public health, safety, and welfare. It is hoped that indirect source review will eventually be incorporated into comprehensive State and local land use planning processes so that social, economic, and air quality factors can be considered in an integrated manner.[1]

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[1] 39 FR 7274, 25 February 1974.

The thrust of this statement, as with previous EPA announcements regarding clarification and interpretation of the proposed regulations, is that the review process is not intended to stop development but rather to ensure the maintenance of air quality.

If, as previously mentioned, developers attempt to circumvent the regulations through changes in the size and location of projects rather than by instituting the design changes necessary to meet review requiements, the effectiveness of the process will be substantially reduced. Therefore, this part of the report will explore trends with respect to the size and location of new shopping centers, office buildings and office parks, and mixed-use developments, and will determine the probability that ISR implementation will lead to a change in these trends.

B. General Comments

1. Introduction

As discussed in Part III, the real estate development industry is currently facing a number of economic problems which may eventually be reflected in the emergence of new trends with respect to the size and location of development. Further complicating the situation is the implementation of ISR.

The evidence of this study is somewhat contradictory with respect to the role of ISR vis-a-vis other factors in impacting on developers' decisions on size and location. In some cases, ISR requirements seem to be the principal determinant of new trends toward smaller sizes and/or increasing suburban construction. In other cases, ISR appears to be only one of several factors, including increased construction costs, energy and material shortages, high interest rates, and local restrictions on growth, which have caused developers to reorient their planning strategy. Nevertheless, the development industry is presently in a high state of flux and many of the trends identified in this section may represent interim rather than long-term responses to rapidly changing conditions. This caveat is important and should be kept in mind while reading this portion of the report.

The discussion that follows focuses on the location and size of new development for shopping centers, mixed-use developments, and office buildings and office parks, the three types of facilities covered by the case studies. The information used to prepare the materials for this "General Comments" section, however, has been drawn from a much wider range of sources. Private developers, organizations representing particular segments of the development industry, air pollution control officials, planners, and members of transportation departments have all contributed to the conclusions presented here.

2. Shopping Centers

a. Location. As perceived by major department stores, the prime tenants of shopping centers, market size and distribution have been and continue to be the primary determinants of shopping center location. In the past there have been some examples of large centers which located in relatively remote (rural to semi-rural) locations in order to take advantage of large lot availability and lower land acquisition costs. Subsequent review of the economics of such facilities have shown them to be less than favorable, however; thus, it is the opinion of major shopping center developers that future siting decisions will focus on areas closer to major markets.[1]

With regard to whether proximity to major markets would mean suburban location, urban fringe, or downtown location, a number of countervailing forces are at work. For example, land acquisition prices, property taxes, costs of upgrading poor quality "pass-over" land, and other costs of inner-city locations are commonly much higher than those for sites in surrounding areas. In addition, major department stores often balk at the rent levels necessitated by these incremental costs, especially those required to support large on-site, non-revenue-producing parking facilities.

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[1] For example, an article appearing in the 9 March 1974 issue of Business Week stated, "Retailers with shopping centers that are far away--10 miles or so--from high population areas are suffering." The article went on to cite Korvette and Abraham & Straus as examples of chains that were experiencing "fall-offs" in malls that were "off the beaten track." Recent fuel shortages have greatly aggravated the problem.

To simply acquire sizable plots of land--irrespective of cost--can be a problem in downtown locations because of fragmented patterns of property ownership. There are two possible solutions to this particular problem. One is to construct the facility in conjunction with a redevelopment authority which has the right of eminent domain. This practice is becoming more common, although it often means that a developer who has traditionally been concerned with shopping centers finds himself involved in mixed-use development, a trend which is more fully discussed in Section 4, below.

The second alternative to overcoming the obstacle of large lot acquisition in downtown areas is to erect multilevel shopping centers. Although there are examples of this type of facility in existence today, there is a great deal of uncertainty within the industry over the economic viability of such establishments--especially in view of the desire of most tenants to be on the first level.

Despite the problems associated with downtown location, urban revitalization is occurring in several localities and new urban shopping malls have been built in such areas as Los Angeles, Pittsburgh, Chicago, Worcester, Springfield, Salt Lake City, Oakland, and Kansas City. In some cases, such as a major center that opened in October 1973 in Queens, New York, the development is integrated within the existing urban scene. In other cases, the development may be integrated within an urban sub-center such as Century City in Los Angeles, Crystal City in Washington, D.C., and Colony Square in Atlanta.

The reasons given for renewed interest in urban locations range from the recognition of a very subtle change in attitude that is taking place in personal life-style choices ("People are admitting that they miss the varied services of the city, and many of them really want to come back-- to work and, in some cases, to live.")[1] to the realization that there are economic advantages to such sites:

> As proven in suburban regional developments where similar principles adhere, retail opportunities flourish in such well-trafficked environments. Urban sub-regional megastructures will offer efficient land usage for centers offering terrific concentrations of comparison shopping opportunities within a single ownership entity.[2]

Despite this renewed interest in urban area developments and the fact that many suburbs--particularly those outside major metropolitan areas--represent saturated markets, suburban sites are still highly attractive for new mall development. There are a variety of reasons for this. The first relates to the barriers to downtown development, including access problems, inadequate parking, higher land costs, proliferation of land ownership, limited site availability, politics, and safety and security problems which tend to deter nighttime shopping. A number of developers have said that politics is the number one obstacle to inner-city development.

The second reason that suburban locations remain a major focus of interest is related to the mounting influence of prospective shopping center tenants in the site selection process. Several large department store chains have been practicing the "land banking" of parcels in growth areas over the past several years. Depending on market conditions at a particular time, the major department stores decide to "open up land" and invite a developer to come in and complete the shopping center package.

A third factor which is somewhat related to the point made above is the fact department store chains prefer sites that are in proximity to the affluent markets which have developed in many suburbs.

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[1] "Suburban Malls Go Downtown," Business Week, 10 November 1973, p. 90.

[2] S.O. Kaylin, "SCW Study Offers New Base for Projections," Shopping Center World, January 1973, p. 37.

A fourth reason favoring suburban sites is that most major department stores are already located in downtown areas and do not want to sponsor further development in areas which might cut into existing markets.

Shopping center developers seem to feel that ISR would be only one more factor that would encourage the selection of suburban rather than downtown sites. Their reasons are that (i) the higher CO background levels in urban areas would make it more difficult to plan a facility which would not worsen CO concentrations; (ii) roadway widening and other design changes would probably be economically unfeasible in densely populated downtown areas; and (iii) it would often be difficult to implement mass transit alternatives effectively because of a reluctance on the part of the general public to utilize this transportation mode for shopping trips.

In addition to the perceived impact that developers feel ISR would have on urban versus suburban locations, some localized effects of the review requirements might also emerge. For example, sites near major traffic arteries and intersections requiring costly roadnet design changes in order to attain ISR approval would probably be abandoned. Some developers also indicated that they might look more closely at sites located more than one quarter of a mile away from major traffic problem areas.

b. Size. ISR impact on the size of shopping center developments is of far greater importance than ISR impact on the location of developments. All developers contacted during the course of this study--both large and small--stated that the principal response to ISR would be the proliferation of projects with parking spaces less than the "triggering points" (1,000 parking spaces within SMSA's; 2,000 parking spaces outside SMSA's). In some cases, they said that these smaller developments would take the form of freestanding department stores. In other cases, they would appear as strip development or "mini-centers."

Developers who have traditionally been concerned with regional centers have all established divisions to investigate small-scale or mini-center development. These large developers feel that as they begin "to go smaller," the competition will begin to force many smaller developments out of business. Consequently, while the direct impact of ISR on small developers may be minimal, the indirect impact resulting from increased competition may be very significant. In attempting to ascertain whether size reductions would be a significant effect of ISR implementation, two questions were legitimately raised:

(i) Are the returns from large (regional) shopping malls significantly greater than those from small facilities (community and neighborhood shopping centers), so that a developer would probably absorb a certain amount of ISR-related costs rather than perfunctorily decide to reduce the size of a proposed facility?

(ii) Is there evidence of a trend toward smaller size shopping centers even without ISR?

Exhibits IV-1, IV-2, and IV-3 address the first question. They illustrate operational cash flows for shopping centers of different sizes. Under standard zoning guidelines (5.5 spaces per 1,000 square feet GLA), regional centers would have 2,200 associated parking spaces; community centers would have 880 spaces; and neighborhood centers would have 275 spaces. The figures used in the cash flows were derived from the most recent compilation of shopping center financial information.[1] These data, however, represent centers built between 1969 and 1972. Since then rising costs and tight money have significantly impacted shopping center developments. Nevertheless, the computations indicate that if developers choose to build smaller centers in response to ISR (i.e., to build at community scale rather than regional scale), this reduced scale would not significantly impair the financial feasibility of the project.

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[1] Urban Land Institute, The Dollars and Cents of Shopping Centers: 1972, Washington, D.C., 1972.

EXHIBIT IV-1
REGIONAL SHOPPING CENTER*
OPERATIONAL CASH FLOW

Income	
Rental	$ 968,000
Expenses	
Operating Costs Including Unrecovered Property Taxes	(340,000)
Cash Available for Debt Service	$ 628,000
Debt Service**	(552,500)
Cash Flow	$ 75,500
Cash Flow per Gross Square Foot	$0.30
Return on Developer's Investment of $1.5 million***	16%

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*400,000 square feet GLS of which 38% is major stores.

**$6 million total project cost @ 8.5% constant.

***Assumes 75% financing.

Source: Calculated from Urban Land Institute, The Dollars and Cents of Shopping Centers: 1972, Washington, D.C., 1972.

EXHIBIT IV-2
COMMUNITY SHOPPING CENTER*
OPERATIONAL CASH FLOW

Income	
Rental	$ 326,400
Expenses	
Operating Costs Including Unrecovered Property Taxes	(110,400)
Cash Available for Debt Service	$ 216,000
Debt Service**	(182,750)
Cash Flow	$ 33,250
Cash Flow per Gross Square Foot	$0.28
Return on Developer's Investment of $537,000***	15%

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*160,000 square feet GLS of which 27% of GLA is major stores.

**Total project cost of $2.15 million @ 8.5% constant.

***Assumes 75% financing.

Source: Calculated from Urban Land Institute, The Dollars and Cents of Shopping Centers: 1972, Washington, D.C., 1972.

EXHIBIT IV-3
NEIGHBORHOOD SHOPPING CENTER*
OPERATIONAL CASH FLOW

Income	
Rental	$ 108,000
Expense	
Operating Costs Including Unrecovered Property Taxes	(34,500)
Cash Available for Debt Service	$ 73,500
Debt Service**	(66,300)
Cash Flow	$ 7,200
Cash Flow per Gross Square Foot	$0.21
Return on Developer's Investment of $195,000***	12%

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*50,000 square feet GLA of which 32% is major stores.

**Total project cost of $780,000 @ .085 constant.

***Assumes 75% financing.

Source: Calculated from Urban Land Institute, The Dollars and Cents of Shopping Centers: 1972, Washington, D.C., 1972.

With regard to the second question there is some evidence that small developers have been entering joint ventures with major chain department and discount stores to build freestanding facilities. The initiative for this trend has been coming from the chain stores, partly because of the uncertainties in timing involved in setting up large multitenant malls and partly because some of them have been able to equal or exceed demand under freestanding conditions. There are two reasons for this. With this arrangement, a wider range of commodities can be offered; also, some lines which they previously could not carry because of an overlap with other stores in a center can now be sold.

In the case of freestanding facilities, it is possible that chain stores would use ISR to rationalize a trend that already exists, thereby lessening the resistance of large developers to "go small." Mini-centers, however, seem to be largely a response to ISR. Nonetheless, developers seem to feel that the environmental impact of these small-scale facilities may be detrimental in terms of increased VMT for shopping purposes as well as in terms of lower economies which would prohibit landscaping, the construction of retention ponds, and other environmental measures which are currently being incorporated into designs for regional centers.

3. Office Buildings and Office Parks

a. Location. The markets for office space can be broken down into five broad categories: major institutional, general commercial, medical/dental, quasi-industrial, and pure industrial. However, as the first two markets are the most important in terms of the number and size of facilities, they are the focus of the following discussion.

Many factors contribute to a locational decision. Traditionally, offices have located in the central city in order to take advantage of transportation facilities, access to other businesses and services, and the available labor force. However, with the increasing trend of suburban development, many offices have gone to outlying metropolitan areas. The relative advantages and disadvantages of urban and suburban locations are outlined below:[1]

Suburban Advantages

- Ample on-site parking
- Free-flowing traffic movement
- Good road access on interstate highway system
- Spacious surroundings, room to expand
- Lower rent
- Buildings designed for tenant needs
- Local, better educated part-time female labor force
- Less commuting distance (in most cases)

Urban Advantages

- Public transit
- Access to governmental services
- Full range of eating and shopping facilities
- Major banking and brokerage houses and other professional services
- Proven labor market

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[1] J. Ross McKeever, Business Parks, Technical Bulletin 65, The Urban Land Institute, Washington, D.C., 1973, p. 12.

Suburban Disadvantages

- Little or no public transportation
- Unknown labor supply
- Less familiar location for clients
- Eating and shopping facilities often limited

Urban Disadvantages

- Traffic congestion
- Need public transit improvements that slated until late 1970's and early 1980's
- Higher rents
- Obsolescent space
- More noise and crime

In general, firms which demand day-to-day access to resources in urban areas tend to select nearby locations. In some cities, certain activities (especially in the banking field) are legally tied to the central city. Thus, consumer-oriented organizations, financial and banking institutions, and law firms usually prefer downtown locations. However, firms with an established and self-contained routine or firms anticipating rapid expansion are more inclined to consider outlying areas. For example, as new and medium-size firms grow, they have less of the traditional incentives for CBD location. Further, as managers with suburban office experience reach high levels, they will have a more favorable view toward suburban location than their precedessors. Thus, production-oriented manufacturing firms, computer operations, and machine billing offices are increasingly favoring suburban locations.[1] Once settled (in either type of location), tenants rarely relocate to office space outside their normal market area.[2]

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[1] Gerald Manners, "The Office in Metropolis: An Opportunity for Shaping Metropolitan America," Economic Geography, Vol. 50, No. 2, April 1974, p. 101.

[2] Detoy and Rabin, op. cit.

EXHIBIT IV-4
ESTIMATED GROWTH IN CENTRAL CITY AND SUBURBAN OFFICE SPACE IN SEVERAL METROPOLITAN AREAS, 1960-1972*
(In Million Gross Square Feet)

SMSA	Zone	1960	1972	Increase 1960-1972	SMSA Population 1970
New York	Total	275	483	208	16,178,700**
	Central city CBD	140 (51%)	244 (51%)	104 (50%)	
	Rest of SMSA	135 (49%)	239 (49%)	104 (50%)	
Chicago	Total	49	88	39	6,978,000
	Central city CBD	48 (98%)	73 (83%)	25 (64%)	
	Rest of SMSA	1 (2%)	15 (17%)	14 (36%)	
San Francisco	Total	22	52	30	3,109,500
	Central city CBD	19 (86%)	34 (65%)	15 (50%)	
	Rest of SMSA	3 (14%)	18 (35%)	15 (50%)	
Atlanta	Total	23	49	26	1,390,200
	Central city CBD	11 (48%)	20 (41%)	9 (35%)	
	Rest of SMSA	12 (52%)	29 (59%)	17 (65%)	
Minneapolis-St. Paul	Total	11	45	34	1, 813,600
	Central city CBD	10 (91%)	20 (44%)	10 (29%)	
	Rest of SMSA	1 (9%)	25 (56%)	24 (71%)	
Houston	Total	15	42	27	1,985,000
	Central city CBD	11 (73%)	22 (52%)	11 (41%)	
	Rest of SMSA	4 (27%)	20 (48%)	16 (59%)	
Boston	Total	19	39	20	2,753,700
	Central city CBD	18 (97%)	29 (75%)	11 (55%)	
	Rest of SMSA	1 (3%)	10 (25%)	9 (45%)	
Dallas	Total	13	29	16	1,556,000
	Central city CBD	10 (77%)	16 (55%)	6 (35%)	
	Rest of SMSA	3 (23%)	13 (45%)	10 (65%)	
Cleveland	Total	8	19	11	2,064,200
	Central city CBD	8 (97%)	15 (79%)	7 (64%)	
	Rest of SMSA	- (3%)	4 (21%)	4 (36%)	

*The data presented are as consistent as possible, although variations undoubtedly exist between the metropolitan areas in the measurement of office space and the definition of the CBD. The raw data have been adjusted where possible to reflect, on a gross square footage basis, medium-and large-sized (over 20,000 square feet) detached office buildings. The data exclude offices attached to factories, warehouses, etc., and office space in hospitals and universities.

**New York-Northeast New Jersey Standard Consolidated Area.

Sources: New York-New York City Planning Commission; Regional Plan Association; Tri-State Regional Planning Commission; Fortune Magazine, February 1973; Chicago-Real Estate Research Corporation; City Planning Department; Building Owners and Managers Association; Continental Illinois National Bank; San Francisco-Department of City Planning; Northern California Real Estate Research Committee; Atlanta-Atlanta Regional Commission; Houston-Bank of the Southwest; Boston-Boston Redevelopment Authority; Ryan and Eliot, realtors; Minneapolis and St. Paul-Metropolitan Council of the Twin Cities Area; Dallas-Chamber of Commerce; Cleveland-Ostendorf-Morris Company, realtors.

In the past decade, office development has shown a strong preference for the less-populated areas within SMSA's. For example, 71 percent of all new office spaces built in the Twin Cities from 1960 to 1972 were located in the suburbs. In Atlanta, 65 percent of office development was in suburban areas: in Houston, 59 percent of office development was also in the outlying metropolitan areas.[1] A comparison of growth in central city and suburban office space in the major metropolitan areas is presented in Exhibit IV-4, including the amount of new office space built in 1960 and 1972 as well as the percentage increase between those two years.[2]

Many office parks are locating farther from the metropolitan core in the newer and higher income suburbs on the edge of the SMSA (for example, Greenwich and Stamford, Connecticut; Oak Brook and Schaumberg, Illinois; and Wellesley and Waltham, Massachusetts). However, some office developments are also locating in older inner-suburban centers of larger metropolitan areas (for example, Brooklyn, New York; Evanston, Illinois; and Brookline, Massachusetts).

Some of the factors which may influence the development of office parks include airports (as evidenced by the developments near O'Hare Airport in Chicago and Hartsfield Airport in Atlanta), major shopping centers[3] (the Galleria development in Houston is an example), and access to middle- and high-income residential neighborhoods.[4] The most important factor for suburban office park location is access to interstate highways.

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[1] Gerald Manners, "The Office in Metropolis: An Opportunity for Shaping Metropolitan America," Economic Geography, Vol. 50, No. 2, April 1974, p. 101.

[2] Ibid.

[3] J. Ross McKeever, Urban Land Institute, telephone interview, 12 June 1974.

[4] Manners, op. cit., p. 96.

While office development is increasing in many suburbs at a faster rate than in the central city, the growth of CBD's should continue through the 1970's spurred on by office developments.

In many CBD's, Federal urban renewal funds are used to facilitate, if not actually subsidize, the construction of new office buildings. Such development has also been encouraged for the general good since the economic base in some metropolitan areas is deteriorating.

Thus, recent CBD development is not merely the result of economic growth. Powerful noneconomic forces have also contributed in certain cases. For example:

- New York - Economic Development Administration's public relations activities and high-level personal contacts.
- Chicago - Mayor Richard Daley's rapport with the established business community responsible for redevelopment of the Loop.
- San Francisco - Powerful Chamber of Commerce which encouraged communities and the Federal government to bear the investment costs of the Bay Area Rapid Transit (BART) system.
- Boston - Chapter 121A of the Massachusetts statutes, permitting the city to guarantee to owners of new office blocks tax stability over an extended period (stability not shared by older offices or by other real estate).

In summary, renewed strength in some inner-city areas has been documented, as well as a continual surge of office development in the suburbs. In the future ISR will probably have only minimal impact on trends for locating office buildings and parks. The more important forces at work in the location of such facilities will be the general state of the economy (causing many companies to forego expansion or to speed up changes in location as a response to inflation); the availability of Federal funding, especially for urban renewal and mass transit projects; and the availability of labor in suburban areas.[1]

b. Size. Office buildings have been growing in size, although in a vertical rather than in a horizontal sense. There are a number of reasons for this:

> Skylines have been stretching higher not only in the largest metropolises but in many of America's smaller big cities, such as Louisville, Hartford, and New Orleans. There are fundamental reasons why buildings have been getting taller. Many companies are anxious to bunch near the center of town where space is limited and land costs enormous, so buildings must go up, and up, and up. It has also become more convenient, and often safer, to move erect anthropoids in business suits up and down in an elevator rather than horizontally along a long hall, sidewalk, or rail line. The problems of street congestion still afflict cities, and mass-transit technology is scarcely flourishing. But there have been improvements in skyscraper technology ranging from double-deck elevators to lighter, stiffer steel frames and completely unmanned machines to wash exterior glass walls.[2]

Constant increases in size, however, have not been completely without critics. For example, by public demand San Francisco's recent zoning laws established a 40-foot height limit over three-quarters of the city.[3] New office construction is also meeting opposition as lavish consumers of electric power.

Office building developers are generally not concerned with the impact of ISR on the ultimate size of their projects (although cost impact is another issue altogether). They seem to feel that the nature of facility use (that is, hours of operation) is fairly amenable to control through such means as carpooling and/or staggered work hours.

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[1] This refers to total labor supply by skill level required. Labor cost differentials between areas are generally too small to account for changing office location. The cost difference between the most expensive areas (such as New York City or Chicago) and other suburban labor forces is only around 4 to 6 percent

[2] Walter McQuade, "A Daring New Generation of Skyscrapers," Fortune, February 1973, p. 78.

[3] Ibid., p. 152.

Owners of parking facilities, however, are much more concerned about both ISR and parking management programs than are the developers of office buildings; this is often the raison d'etre for an independently operated parking lot or garage. A large measure of the concern of parking facility owners is based on the fact that the type of design changes needed to ensure traffic flow may be well beyond the financial means of the independent owner. Consequently, they would probably respond by building smaller facilities. The result in some cases would be to force on-street parking, which would only increase traffic congestion on surrounding roadnets.

4. Mixed-Use Projects

a. Location. Mixed-use projects (residential plus commercial use) vary greatly in size from a single structure to an entire "new community" complex. Locations also vary from inner-city developments to freestanding developments in largely rural settings (although the latter are by far the exception).

Locations within urban and suburban areas are subject to the same countervailing forces as discussed previously in connection with shopping centers and office buildings. However, on the whole, trends seem to point to higher rates of development in the suburban portions of SMSA's.

A new and highly significant trend is to combine complementary uses within a shopping center. Office space, apartments or condominiums, and hotels are logical complements to a retail core. Developers see two major advantages in mixed-use developments over a single-use shopping center concept. The first advantage is an expression of a fundamental interest in the profit motive. Complementary uses enhance the demand potential at a given location. The second advantage relates to the fact that certain shopping centers in the past have been ruined by the growth of haphazard development on their fringes. Developers are purposely buying up tracts of land far in excess of their needs to thwart the onslaught of undesirable peripheral activities.[1]

Mixed-use development has also been stimulated because of large-scale office building construction. The trend toward condominium ownership is providing an extra impetus to this type of project.

There are presently about 150 new towns, communities, and large developments in various stages of planning and/or construction. Their total planned population is more than nine million, with an average size of about 60,000.[2] Almost all of these developments will be concentrated around existing centers of population concentration (see Exhibit IV-5). For example, of 10 new communities which have already been approved by HUD (with an estimated population of 687,000), nine will be in suburban locations 10 to 30 miles from a metropolitan center (see Exhibit IV-6).

Only one of the 10 new towns shown in Exhibit IV-5 is a "new town in town," although Chicago now has plans for such a development to provide housing for 120,000 residents. Although there are a few freestanding new towns like Soul City, the scarcity of new towns based on a rural economy reflects the reservations of the financial investor and the absence of appropriate managerial capability.

The Federal limitations on funding for low-income housing and the Federal reluctance to release special planning assistance grant funds provided for under Title VII of the Housing and Urban Development Act of 1970 are cited as being especially discouraging to efforts to erect "new towns in town."[3]

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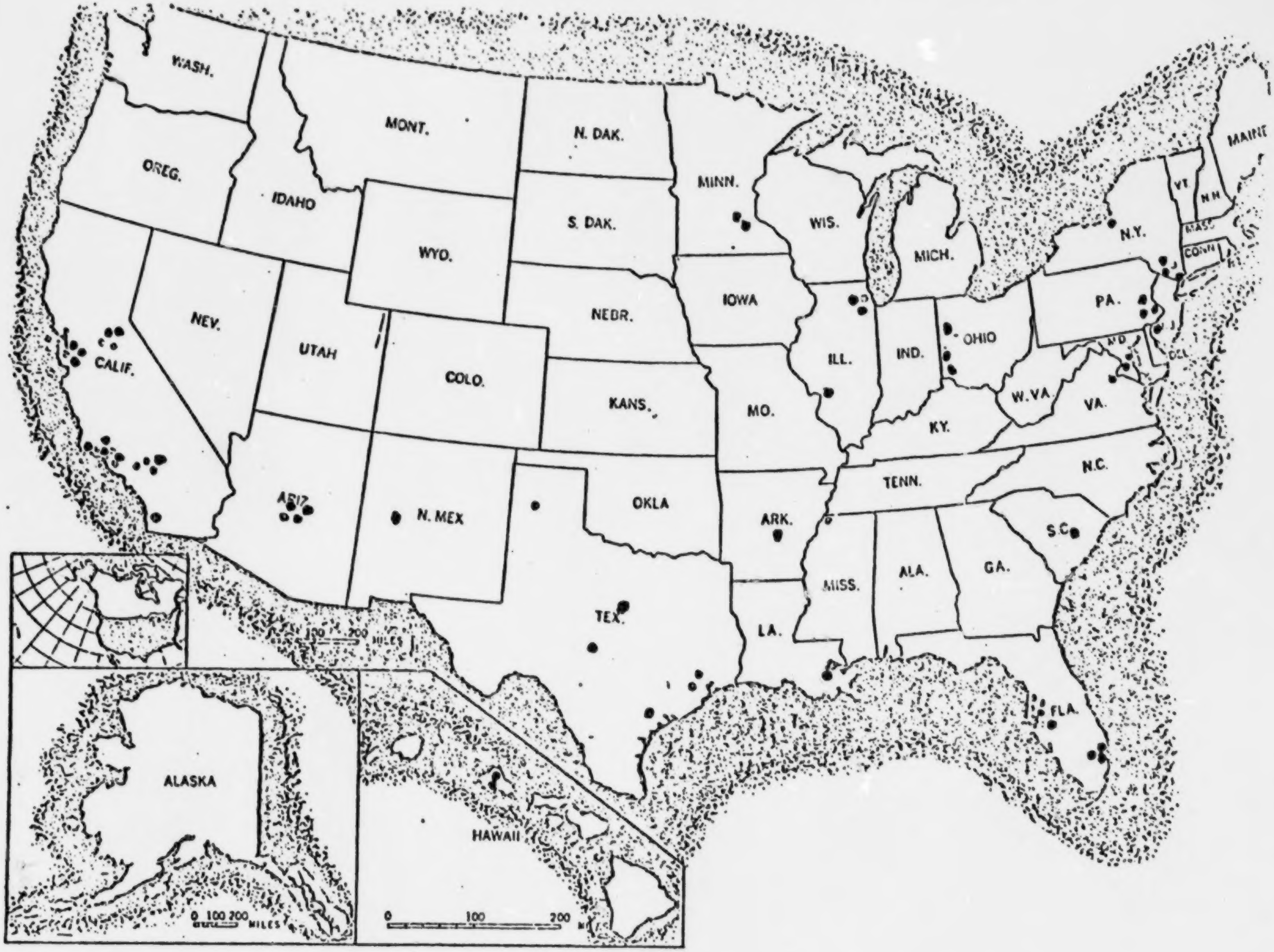
[1] "Downtown Has Fled to the Suburbs," op. cit., p. 83.

[2] U.S. Postal Service, New Towns and the U.S. Postal Service, 1973, p. 6.

[3] Architectural Record, December 1973, p. 87.

EXHIBIT IV-5
PLANNED NEW TOWNS WITH A POPULATION GREATER THAN 50,000


WASH.
MONT.
N. DAK.
MINN.
OREG.
IDAHO
WYO.
S. DAK.
WIS.
MICH.
N.Y.
VT
N H
MAINE
MASS
CONN
R.I.
NEV.
UTAH
COLO.
NEBR.
IOWA
ILL.
IND.
OHIO
PA.
N.J.
MD
DEL.
W.VA.
VA.
CALIF.
KANS.
MO.
KY.
ARIZ.
N. MEX
OKLA
ARK.
TENN.
N.C.
S.C.
TEX.
MISS.
ALA.
GA.
LA.
FLA.
ALASKA
0 100 200 MILES
HAWAII
0 100 200
100 200 MILES

Source: U.S. Postal Service. New Towns and the U.S. Postal Service 1973.

EXHIBIT IV-6
SUMMARY OF NEW COMMUNITIES FINANCING GUARANTEED BY HUD
($ in Thousands)

Community Name	HUD Guarantee Commitment Amount Date	Guarantees Amount Date	Issued Interest Rate	Water & Sewer	Supplementary Grant Reservations Amount/Date Open Space	Other	Population (Projected)	Dwelling Units (Projected)	Location
Jonathan, Minnesota	$21,000 2/70	$21,000 6/72 *	7.20%	$216 6/70	--	--	50,000 in 20 years	15,500 in 20 years	20 mi. S.W. of Minneapolis
St. Charles Communities, Maryland	$24,000 6/70	$18,500 12/70*	7.75%	$757 6/70	$102 6/70	$900 3/71 (EPA)	75,000 in 20 years	24,872 in 20 years	25 mi. S.W. of Washington, D.C.
Park Forest South, Illinois	$30,000 6/70	$30,000 3/71	7.00%	--	$176 5/71	--	110,000 in 15 years	35,000 in 15 years	30 mi. S. of Chicago
Flower Mound, Texas	$18,000 12/70	$14,000 10/71	7.60%	--	--	--	64,000 in 20 years	18,304 in 20 years	20 mi. S.W. of Dallas
Maumelle, Arkansas	$ 7,500 12/70	$ 4,500 6/72	7.62%	$330 6/71	--	$231 6/71 (EPA)	45,000 in 20 years	14,390 in 20 years	12 mi. N.W. of Little Rock
Cedar-Riverside, Minnesota	$24,000 6/71	$24,000 12/71	7.20%	--	--	--	30,000 in 20 years	12,500 in 20 years	Downtown Minneapolis
Riverton, New York	$12,000 12/71	$12,000 5/72	7.125%	--	--	--	25,600 in 16 years	8,010 in 16 years	10 mi. S. of Rochester
San Antonio Ranch, Texas	$18,000 2/72	--	--	--	--	--	88,000 in 30 years	28,676 in 30 years	20 mi. N.W. of San Antonio
The Woodlands, Texas	$50,000 3/72	--	--	--	--	--	150,000 in 20 years	49,000 in 20 years	30 mi. N. of Houston
Gananda, New York	$22,000 4/72	--	--	--	--	--	50,000 in 20 years	17,200 in 20 years	12 mi. E. of Rochester
Cumulative Total	$226,500	$122,000	--	--	$2,712	--	687,000	223,452	

*Guaranteed under Title IV, HUD Act of 1968; all other guarantees under Title VII of HUD Act of 1970.

Source: HUD Challenge, August 1972.

Conversations with many developers seem to indicate that ISR would not be a major force in mixed-use projects in terms of location, short of a denial of a permit. Redevelopment authorities feel that projects that are largely publicly funded have sufficient pre-planning to incorporate design changes, relatively assured financial backing over the life of the project, and even some degree of leverage with highway departments to assist in having specific design changes made within required periods of time. Private developments, however, might face severe constraints. Generally, large-scale mixed-use projects are phased. Developers often prefer or are forced to be flexible on later phases to meet the requirements of a constantly changing economic world situation. This creates problems with respect to the early review of all stages of a phased development. In particular, developers are concerned that many financial institutions might not provide backing for even the first stage of a development without seeing ISR approval for the entire project.

b. Size. To the extent that developers perceive a deleterious impact on phased mixed-use projects as a result of the ISR process, their response might be to focus on the construction of smaller, freestanding projects. Such a trend should be monitored, but at this time there is no basis for determining ISR impact.

C. State and Local Experience Related to Size and Location

1. Introduction

The following paragraphs present the study findings on experiences in Florida, Philadelphia, and Oregon which are pertinent to the issue of ISR impact on the location and size of new development. The information from the state and local experience investigation is much more limited than the information on economic impact presented in Part III. This is due to the fact that reviewers as well as developers who have participated in the review process are not usually aware of sites which might have been abandoned, reductions in proposed sizes of facilities, and other actions initiated either to circumvent the regulations or out of fear that an application for review might be disapproved.

2. Florida

As a force by itself, ISR is exerting minimal impact on the location of real estate development in Florida, with the exception of three counties: Dade, Broward, and Palm Beach. In each of these counties CO standards have been lowered from 35 ppm to 12 ppm for a peak one-hour period and from 9 ppm to 8 ppm for an eight-hour period. Siting developments of ISR magnitude in any one of these three counties, which encompass such areas as Miami and Fort Lauderdale, might present problems and dictate costly design changes. However, the remainder of the state could absorb a significant increment in CO emissions without violating standards and therefore may be more attractive to developers in terms of future sites than the three counties.

ISR is only one factor affecting the developer's choice of location. Other factors which might have to be considered include:

- Development of Regional Impact. The Florida legislature requires the review of certain developments which might affect the citizens of more than one locality because of the development's character, magnitude, or location. DRI overlaps with ISR to some degree, but it differs in that it addresses all environmental and natural resource impacts as well as the effect of the development on the economy, public facilities, public transportation, and housing of a region.

- Water Quality. The supply of water has become a major concern in Florida. Certain areas, particularly in the southern part of the state where the water supply is limited, are suffering from severe drought.

- Growth Moratoria. Forty communities in Florida are refusing permits for sewer hookups as a means of controlling growth. Water supply shortages are often the leading reasons for a moratorium. In addition, Boca Raton, through its zoning code, has put a ceiling on the construction of residential units as a growth control.[1]

- Traffic Flow Requirements. The Florida DOT requires the maintenance level of service "C" on all of its highways and highway interchanges. The developer of a project that would jeopardize a "C" classification on a roadway segment or at an interchange must absorb, at least in part, the cost of changes needed to maintain the appropriate level or service. Developers of large-scale projects, especially shopping centers, consider this requirement one of the most limiting in the state as well as an enormous financial burden.

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[1] "Nation's Cities Fighting to Stem Growth," The New York Times, 29 July 1974.

- Non-Degradation. DPC is contemplating a non-degradation strategy for CO. The proposed course of action would limit increases in CO concentration to a 5 percent increment above a 1972 baseline. This would effectively prevent large developments from being constructed in rural areas.

These forces, combined with ISR, might have significant implications on the location of new development. For example, developers feel that they might have to avoid more densely populated areas because of the obstacles and cost of trying to meet the level of service "C" road criterion. Meeting this criterion would have a substantial impact since DRI, and sometimes ISR, approval will not be issued without verification from DOT officials that level of service "C" will be maintained.

If densely populated areas present problems in the locating of new development, some developers would look elsewhere. Developers of shopping centers, however, would probably scale down the size of their developments rather than relocate, in order to satisfy the department store chain requirements for entrance to a new market. Designated Areas of Critical Concern or the proposed non-degradation regulations, however, might discourage them from moving into very sparsely populated areas. In this particular respect, Florida is moving in a direction which is opposite that of EPA's ISR regulations which impose higher triggering points outside of SMSA's for review (i.e., triggering points of 2,000 rather than 1,000 new parking spaces outside of SMSA's).

The so-called "locational squeeze" might seem to encourage developers to look for sites in suburban areas, but suburban areas are generally those which have been involved in imposing growth moratoria. Consequently, ISR is only one of a number of factors impacting location in Florida. The actual location patterns for new development, however, are hard to discern--although the general consensus among developers is that suburban locations would be the principal focus of activity.

In terms of the impact of ISR on size distribution, there is no strong evidence that it is or is not a factor for mixed-use and office projects. Developers tend to feel that is has not been a factor in these two areas so far. Small-sized development companies in Florida seem to be the most concerned about staying below the triggering points so they will not have to bear the costs of monitoring, modeling, and time lost in review.

3. Philadelphia

AMS anticipates few developments of ISR magnitude in Philadelphia; the city is already very heavily developed. There has not been, and probably will not be, enough experience to measure the impact of ISR on the location and size of new development.

There is, however, significant concern on the part of the City Planning Commission regarding the possible impact of ISR on downtown redevelopment. For at least 12 years, Philadelphia has been planning a large-scale mixed-use project in the center city which will incorporate off-street parking structures. The designs for these structures are not yet finalized. Because the project is federally funded, an EIS must be prepared and is now in the preliminary stages.

The City Planning Commission is aware of Philadelphia's air quality problems. Air quality considerations have already caused a reduction in parking for the proposed mixed-use project mentioned above. Although plans were originally drawn up for six garages, only four are currently proposed. Still, there is concern that these four garages will aggravate CO conditions to the extent of prohibiting their construction.

The city is heavily committed economically, socially, and politically to the project as it is now planned to incorporate retail and office uses; thus, a significant reduction in parking could jeopardize the entire project design. It is felt that major retail anchor tenants would withdraw from participation in the project as the result of a major reduction in parking facilities, unless it could be proven that the transit proportion of the modal split would be large enough to adequately offset the loss of parking.

The City Planning Commission feels strongly that air quality considerations must be balanced against all other city goals and should not have supremacy. Furthermore, members of the commission doubt that the denial of an air quality permit to this development would stop the project. They feel that city politicians would try and override an air quality decision, to the extent of ignoring any conditions that might be issued with the permit.

The above opinion represents the view of one agency. This agency is not fully aware of the enforcement powers behind ISR which become effective on 1 January 1975. What might be inferred from the comments of the City Planning Commission is that a controversial air quality decision by AMS after the effective date might necessitate backing from agencies at higher levels of government. Ostensibly, the Penn DER would become involved, as perhaps would EPA.

4. Oregon

Some preliminary remarks need to be made to qualify the Oregon experience with large-scale development prior to embarking on a discussion of trends. To begin with, all facilities are reviewed down to 50 parking spaces. Consequently, there is no evidence of developers purposely planning parking facilities in the state below the triggering point. Second, most development in Oregon is done on a small scale. The state population is dense enough to support only a handful of large-scale projects above the Federal ISR triggering points. Finally, large-scale development beyond the five-mile periphery of the state's three major municipalities is economically unsound; population densities in such areas are not adequate to support major development projects. DEQ anticipates no locational shifts within the state itself to areas beyond the five-mile periphery for the express purpose of avoiding a DEQ review. However, across the state line from Portland, where no controls on parking facilities are in effect, development is booming.

Ninety percent of the parking facilities reviewed in Oregon have less than 500 parking spaces. Office buildings are one of the most prevalent activities being developed in the state, according to a source at DEQ, with construction occurring primarily in suburban rather than downtown areas.

DEQ has no grounds for denying approval to suburban projects if the projects are in compliance with air quality standards and are incorporating acceptable incentives for mass transit usage. However, the agency is concerned about the impact of a proliferation of small-scale developments in suburban areas on automobile emissions other than CO. There is no danger of violating CO standards, but VMT might be substantially increased as more and more small suburban developments gain DEQ approvals.

Transit conditions are not always applicable to suburban development in Oregon, and the local transit system might not be able to service the area where the development is located. In such a case DEQ would force the owner to encourage carpooling while providing a minimal number of parking spaces.

To date, two large-scale projects which have been reviewed have been started in the Portland SMSA. One developer initially requested permission to build a facility with 5,219 parking spaces. The second developer had originally planned for 2,464 parking spaces.

In both cases, approvals for parking facility construction have been granted in stages. The developers, therefore, must approach DEQ prior to each new phase of project construction. The project with the original request for 5,219 spaces (a suburban shopping center) was already under construction when ISR procedures were initiated. An approval was granted for 1,997 parking spaces subject to certain transit-related conditions. In subsequent reviews, DEQ has approved 147 spaces above the original request for 5,219. The second project, a mixed-use development, was allowed to construct 272 spaces initially to coincide with the magnitude of the development's first phase. The original letter of approval outlined specific conditions for subsequent project phases.

Each developer also had to implement strategies to encourage transit usage. The suburban, regional-scale shopping center had to install a shuttle bus service. The downtown mixed-use development was told that future approval would hinge on the resurrection of an abandoned rail line for transit use, major roadway design changes, and the installation of feeder bus, mini-bus, or dial-a-bus service.

What makes these two cases particularly interesting is that the review process did not result in a change in either the size or location of the development. However, according to the developers, the conditions imposed during the review process did not result in a change in the number of trips generated by the facilities at their associated stage of development. Neither project has been completed; both intend to add new buildings and parking facilities. Consequently, the impact on the developers was restricted to the economic impact of meeting the review requirements. The impact of the review on air quality, however, might prove to be more adverse than beneficial, since both projects are currently experiencing more parking demand than they are equipped to handle. The situation is far worse at the downtown project than at the suburban one. Visitors to the downtown development are overloading the streets surrounding the project when the parking lot is full and are taking up on-street parking. They have not been deterred from using their cars to visit the development. Parking at the suburban development has proven to be just barely adequate, except on sale days; moreover, 300,000 square feet of gross leasable retail area have yet to open. Even now, during sale days cars are being parked on the surrounding roadnet, on dirt roads in the vicinity of the site, and in areas that have been purposely barricaded to prohibit parking.

D. Case Study Findings Related to Size and Location

1. Introduction

Each of the developers who participated in the case study analyses was questioned as to the impact ISR would have had on his project. They were also asked to outline their future development plans and to describe the impact ISR would have on the location and scale of prospective projects. The responses varied according to the type of development and the size of the development company involved. The responses are presented below, broken down by type of development.

2. Shopping Centers

The two case studies of shopping centers, Projects B and F, were developments of large-scale real estate companies, which both have access to equity for front-end investment and can probably afford to lose some capital if denial of a zoning change, ISR, or another institutional requirement prohibits construction of a project. The review requirements would probably not create a significant financial burden for either company since each of them has been developing sophisticated in-house capabilities for air quality analysis. However, many such losses would increase overhead and the burden on other centers owned by the developer, until eventually even the largest company would begin to suffer from severe financial problems.

Both companies are concerned, however, about the administration of ISR, especially the sensitivity of a review agency to a real estate developer's peculiar problems. Does the reviewer really understand the magnitude of costs associated with a delay? Another concern is the integrity of the review process itself. Will reviewers perform perfunctory analyses of the data submitted to assess the validity of assumptions? Will politics enter the review process? Will ISR be used as an effective land use control to deter unwanted development?

Would these developers have implemented their plans for Projects B and F if ISR had entered into their respective development processes? In the opinion of the developer of Project B, had he been confronted with a permit application he would not have developed at that site. One reason for this decision would have been the density of the surrounding land uses. With the land within the quarter-mile periphery of the site already built up right to the street line, it probably would have been impossible to implement roadway design changes. The second reason would be that transit service was already good and little improvement could be expected in that direction.

Likewise, in the case of Project F, the shopping center modification, the developer feels that he would have abandoned the plans for expansion at the existing location and, instead, would have sought a site outside the city in a less densely populated neighborhood. The scale of the shopping center was apparently more important than the precise siting of the development within the trade area. Hence, ISR would not have impacted on the size of this development, but would have induced the developer to relocate in an area with cleaner air.

Both developers are heavily committed to future shopping center development. One will continue to operate in the United States on a scale subject to ISR. He will stay away from the regional supercenter, however, because of all the inherent risks. Instead, he will focus primarily on smaller scale centers with up to three major department stores and a total GLA approaching 500,000 square feet.

The other developer is setting up a special division to promote shopping center development abroad. He wants to be able to construct a specific amount of total GLA each year, and can have no guarantee of meeting his objectives within the United States because of the uncertainty of ISR and other institutional requirements. Therefore, he will look for sites in countries that have less restrictive policies on real estate development, particularly from a pollution standpoint.

Because of the implementation of ISR, both shopping center developers say they would prefer to become more heavily involved with strip centers with 999 spaces or less and with freestanding department stores. These developers admit that many of their locations are selected in response to department stores rather than as a result of independent decisions. If a leading chain wants to locate in a certain area, it will either ask the developer to prepare a plan for a pre-selected site or to assemble a parcel within the locality. If the area is found to have CO problems or if design changes would be hard to implement because of high-intensity land use patterns, the developer would be pressed to gain ISR approval rather than abandon a location desired by a department store chain. If a proposed facility were in violation of CO standards, however, the developer would undoubtedly recommend reducing the scale of the project. If the project could not be built with 1,000 or more spaces, the developer would suggest going just below the triggering point for review.

3. Office Parks

The developers of the two office park cases, Projects A and E, represent relatively small-sized enterprises. One developer operates in a single metropolitan area and has confined his developments solely to office use. The other has a regional base and is diversifying into mixed-use projects. Both have traditionally been wedded to suburban locations. Both, however, are beginning to diversify into downtown developments.

The prospective implementation of Federal ISR took one of the two developers totally by surprise. The other was already versed in the regulation through a real estate trade association. Both had identical responses to the prospect of air quality permits: to build each discrete phase of a given office park development with its associated parking comfortably below the triggering point for review. Although each might be successful in avoiding ISR, there is always the possibility that the review agency could apply its discretionary power in requiring ISR prior to construction of a specific phase of a given development.

Each developer is wary of the uncertainty factor, fearful of permit denials, and concerned about equity commitments. One is in no position to absorb front-end losses if one of his projects is disapproved; he has no liquidity. The other could afford an occasional rejection but would prefer to operate with maximum certainty that a contemplated development was a "go" situation.

Focusing on the theoretical impact ISR would have had on Projects A and E, the developer of A states that his likely response would have been to redesign his project buildings and the associated parking lots to circumvent the review process. In the case of Project E, ISR would not have impacted on the project until the development was already half built. The 200,000 square feet contemplated for construction in Year IX of Project E's development process would probably have been scaled down or broken up into smaller discrete units with less than 1,000 parking spaces per associated parking lot. Project E's developer was too committed to the completion of his project in Year IX to absorb further design changes. The project site plan had already taken into account extensive analysis of traffic flow projects, and roadway design changes had already been instituted at great expense to him. There is no guarantee, however, that Projects A and E would have escaped ISR if the responsible review agency had determined that pre-construction review was necessary.

4. Mixed-Use Projects

Projects C and D, because of their respective scales and location, were high-risk propositions. In each case the developer was motivated by factors above and beyond profit, primarily a strong commitment to downtown redevelopment. Developers committed to urban renewal are generally willing to trade off some margin of profitability for a favorable image and national visibility.

Projects C and D were both performed by developers who has no prior experience with large-scale downtown mixed-use projects. One had the cushion of extensive internal equity; the other had a solid real estate track record and access to a fairly substantial credit line.

Each developer responded to the prospect of ISR differently. One objected to the real estate industry's bearing the responsibility for pollution caused by automobiles. This developer, however, stated that he would abide by the review process and not try to circumvent it purposefully. He is actually far more concerned with the impact of transportation controls and parking management plans in areas where mass transit is not a viable option.

The other developer, representing a mixed-use case study, was wary of issues entering the review process which would have no relation to an objective air quality assessment. Further, he questions the reviewer's understanding of the mechanics of real estate development and the economic importance of timing.

In regard to how ISR would have affected Projects C and D if it had been effective prior to their respective construction dates, neither project would have been stopped. Both developers wanted to perfect their projects and were willing to absorb the costs associated with eliminating problems, within reason. Project C was already incorporating design changes with beneficial implications for air quality but at considerable expense to the developer, who had come very close to liquidating his equity funding resources without ISR.

At the outset Project D would probably have undergone a major redesign. The developer's original grandiose redevelopment scheme, when balanced against the realities of traffic congestion and CO emissions, in all probability would have yielded a smaller scale project. The recommendations of the market consultant might have been weighed more carefully since the project, as constructed, exceeded the limits recommended for certain uses.

ISR will have less impact on the location and size of future development for the two mixed-use developers than for those representing the two shopping center projects and the two office parks. Both of these will continue to operate downtown and will undoubtedly conscientiously balance air quality considerations against the scale of prospective projects. Both, however, have expressed concern that many of their plans for downtown revitalization may be killed because of air quality. They point out in this regard that economics can absorb only a limited amount of environmental sensitivity; if people cannot come to a project by car or by some dependable form of mass transit in sufficient quantity to support a development, there is little purpose in building.

E. Conclusions

In general, the impact of ISR on location would be to reinforce existing trends of suburbanization. The magnitude of the impact would vary greatly, depending on the goals of the developer, the severity of existing air quality problems within specific areas, the need to service important tenants or markets, and a variety of other factors. Shopping center developers may have a marginal incentive to avoid the higher CO levels in urban areas, and the economic hardships of necessary design changes. While developers of office buildings and parks might tend toward suburbanization, they would be more sharply influenced by the state of the economy, availability of federal funding, and availability of labor. Short of denial of permit, ISR would not influence the location of mixed-use projects.

The more important impact of the indirect source regulations would probably be on the size of new developments. In the case of shopping centers, the economics of developments above and below the triggering point for review are not sufficiently different for a developer to feel a large degree of hesitancy about reducing the size of a facility to avoid the costs and uncertainty of applying for an ISR permit.

Office buildings and parks would probably not change substantially in size themselves, but would probably reduce associated parking spaces from traditional levels. There are two reasons for this:

(i) Carpooling and staggered work hours could be more readily adopted by office workers than, for example, shoppers.

(ii) Municipal and off-site parking lots could be used to service on-site generated needs.

New mixed-use developments are currently limited in number because of many unfavorable economic conditions unrelated to environmental regulation. If conditions should change, to the extent that good transit systems could be supported by the population density of the area and by the availability of needed funds to support transit operations, size reductions in planned complexes may not be necessary. At this time, however, there is insufficient information to determine ISR impact on the size of mixed-use development.

PART V
ADMINISTRATION

A. Overview

This part of the report addresses a number of procedural issues that might arise in the process of implementing indirect source regulations. Through the many interviews and discussions carried out in connection with this project, it has become increasingly evident that efficient and equitable review procedures may hold the key to preventing or ameliorating adverse economic and land use impacts from ISR, while also furthering the goals of the regulations. Therefore, in this part of the report particular attention is given to various phases of the implementation process itself.

The following discussion parallels the procedures outlined in Part 52 of Chapter I, Title 40 CFR 52.22, as amended. A flow chart indicating the various procedural stages and the associated timing for each is shown in Exhibit V-1.

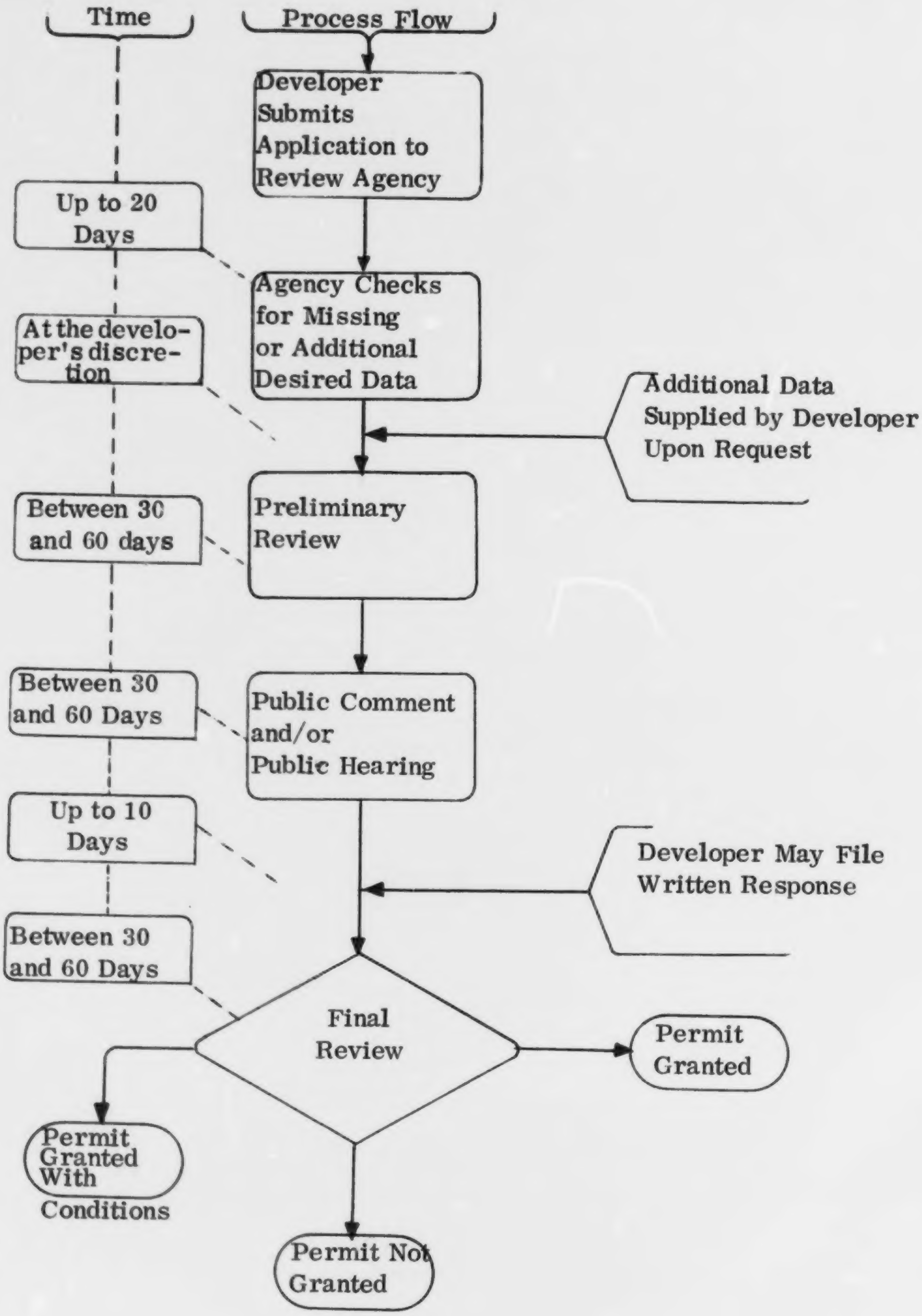
The key steps in the review process which will be discussed in greater detail in subsequent parts of this section are as follows:

- Data Acquisition.
- Application Preparation and Submission.
- Review Process.
- Public Comment.
- Decision.
- Permit.
- Enforcement.

Potential problems that may arise for the developer, the review agency, or both in conjunction with each of the above steps are presented in Section B. Background information for identifying possible problem areas in the implementation of Federal ISR are drawn from the three state and local experience studies.

EXHIBIT V-1

FLOW DIAGRAM OF ADMINISTRATIVE PROCEDURES FOR FEDERAL ISR[1]


Time
Process Flow
Developer Submits Application to Review Agency
Up to 20 Days
Agency Checks for Missing or Additional Desired Data
At the developer's discretion
Additional Data Supplied by Developer Upon Request
Between 30 and 60 days
Preliminary Review
Between 30 and 60 Days
Public Comment and/or Public Hearing
Up to 10 Days
Developer May File Written Response
Between 30 and 60 Days
Final Review
Permit Granted
Permit Granted With Conditions
Permit Not Granted

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[1] It is important to note that there is no allowance for an appeals process in Federal ISR.

Although the review processes being performed in Florida, Philadelphia, and Oregon are not altogether synonymous in form with the proposed Federal indirect source regulations, the three experiences provide insight in terms of certain critical issues which would apply to any air quality review procedure for a major development or public improvement. A brief discussion follows on the nature of the regulations being implemented in each of the three areas and how they differ from the Federal regulations. The differences, however, are relatively minor and should not be overemphasized. The intent of all three state and local regulations is the same as that of the Federal -- to prevent a violation of NAAQS for CO.

1. Florida.

Florida was the first state to implement the indirect source review regulations under Federal approval. In Florida indirect sources are commonly referred to as "complex sources." The objective of Florida's indirect source control strategy is to prevent violations of Federal and state Deparment of Pollution Control (DPC) air quality standards for all mobile source pollutants, although the current interpretation is to address only CO. Much of the state is controlled for the attainment and maintenance of NAAQS.

Prior to the Implementation of ISR, however, three counties -- Dade, Broward, and Palm Beach -- had set standards for CO lower than the Federal NAAQS (that is, 12 ppm for one-hour peak, compared to the one-hour NAAQS of 35 ppm and eight ppm for the eight-hour average, compared to the eight-hour NAAQS of nine ppm). The limits were established since these counties are among the most densely populated in the state and represent important centers of tourism. It was felt that the tourist industry could be adversely impacted by even relatively minor evidence of air pollution. With subsequent passage of ISR, the lower standards have been maintained for these counties.

The criteria for determining whether a facility requires ISR are summarized below:

- Open parking lots for 1,500 cars or more.
- Multilevel parking lots for 750 cars or more.
- Roads for 2,000 vehicles/hour or more.
- Roads for 1,000 vehicles/hour or more in Dade, Broward, Escambia, Polk, Leon, Sarasota, Volusia, and Alachua Counties.
- Tollways /interstates/other major roads with more than two lanes outside of the counties named above.
- Airports designed for scheduled commercial traffic.
- Others as determined by the DPC.

These guidelines differ somewhat from those issued by EPA. The main variation is the EPA distinction between urban and rural requirements which is not considered in Florida.

The DPC regions average two to four ISR applications each week, so that the number of DPC decisions on ISR varies from day to day. To date, approximately 46 applications have completed review by DPC. Of these, 29 (or 63 percent) are highway related; 12 (or 26 percent) are for shopping centers; two are for mixed-use developments; one is for a parking garage; one is for a manufacturing facility; and one is for a sports stadium (see Appendix A).

2. Philadelphia

Philadelphia's Air Management Regulation X, adopted on 20 August 1972, was conceived of as a mechanism to incorporate air quality considerations into the planning process. Under this regulation the following types of development were required to submit an air quality impact statement:

- Industrial or commercial facilities with 500,000 square feet or more of floor space.
- Residential facilities with 100 or more dwelling units.
- Highways.
- Mass transit facilities.

No guidelines were issued in association with Regulation X. The submission requirements focused on assessing all actual and potential air quality impacts at the immediate site and within the region. The facility must be shown not only to be in compliance with local air quality standards, but also to employ the best available and practicable control technology for emissions. The city's Air Management Services (AMS) will issue written approval, assuming the facility is in compliance with the above conditions.

On 4 May 1974, Regulation X was amended to more closely resemble Federal indirect source regulations. The types of facilities subject to review under the amended regulation include but are not limited to:

- Shopping centers.
- Sports complexes.
- Drive-in theaters.
- Parking lots and garages.
- Residential, commercial, industrial, and institutional developments.
- Amusement parks and recreational areas.
- Highway and transportation facilities.
- Sewer, water, power, and gas lines.
- Other such facilities which will result in increased emissions from motor vehicles or stationary sources.

The cutoff points for review were maintained from the original regulation, with the addition of a review for all new or modified parking facilities having a total capacity of 250 or more motor vehicles within the Philadelphia CBD and such facilities having a total capacity of 500 or more motor vehicles outside the CBD. Like the original version, the revised regulation addresses all air pollutants and is not confined to CO.

Files on 16 downtown projects are currently being maintained. Reviews have been officially completed on three of these as of July 1974. Of the remaining 13, seven are not yet far enough along to undergo official review procedures under Regulation X as amended (see Appendix A).

Philadelphia's Regulation X has been submitted to EPA as part of the Pennsylvania state implementation plan (SIP). EPA approval of Regulation X has not yet been granted. Should this still be the case as the effective date for Federal ISR approaches, AMS will request the delegation of indirect source review procedures. In accordance with the 9 July 1974 Federal Register interpretation (p. 25297), AMS will ask for delegation from the state if the Penn DER (State Department of Environmental Resources) has requested ISR delegation. Penn DER indicates that it fully intends to request delegation and to implement Federal ISR. However, if this decision changes, AMS will apply directly to EPA for delegation.

3. Oregon

Since 24 January 1972, Oregon has had an effective pre-construction review procedure for new parking facilities and highways. This procedure applies to projects located within the municipal boundaries or the five-mile limit of any city with a population of 50,000 or more. Parking facilities supplying temporary storage for 50 vehicles or more or having two or more levels as well as highway projects incorporating new freeways, expressways, or portions thereof are subject to review.

The Oregon regulation does not address facilities as being complex or indirect sources because it was promulgated before these terms came into general use. However, the review process is designed to attain the same objective as Federal ISR, namely, preventing NAAQS for CO from being exceeded. The Oregon regulation also addresses the impact of a new facility on (i) the development of low-polluting transportation modes, (ii) noise and water quality, and (iii) the general quality of life in urban areas. For the purpose of this study, only the air quality-related review procedures were evaluated.

In addition to the existing regulations, proposed complex source regulations for Oregon were promulgated on 20 May 1974. After a series of public hearings, revisions were made and a new version was released on 24 June 1974. This version is not considered final and will still be reworked. The proposed regulations differ from the existing review procedure in that they attempt to place a complex source in a regional planning context. Approvals must be in accord with all existing and forthcoming local and regional planning documents. The Department of Environmental Quality (DEQ) is pressuring for the drafting of regional plans that would address all environmental, land use, and transportation issues as well as socioeconomic goals and objectives.

More than 100 cases have been reviewed by DEQ under their regulations (see Appendix A). The majority are small parking facilities with less than 500 spaces which are located in the Portland metropolitan area. The volume of applications can reach 20 per month in the spring.

B. Problem Areas in the Implementation of ISR

1. Data Acquisition

EPA has provided a methodology for "estimating peak CO concentration associated with identified traffic design and operating variables" at a proposed indirect source.[1] As indicated earlier, the Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality were used to measure the CO impact associated with each of the six case studies analyzed in this report.

Aside from the application of the EPA guidelines, the applicant has the option of measuring the CO impact "by use of appropriate atmospheric diffusion models . . . and/or by any other reliable analytic method."[2] Since the Technical Guidelines are designed "as a conservative screening technique to identify situations in which a potential problem may exist,"[3] an applicant may prefer the modeling alternative.

The burden falls on the developer, irrespective of the methodology used to provide sufficient data for a review. The developer relies upon the guidance of the review agency in collecting the necessary data. The problems that have developed in relation to data acquisition are as follows:

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[1] U.S. Environmental Protection Agency, Office of Air Quality Planning and and Standards, Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality, July 1974, p. ii.

[2] 40 CFR 52.22 (b) (4) (ii).

[3] EPA Guidelines, op. cit., p. ii.

- The absence or incompleteness of ISR guidelines[1] specifying the assumptions to be used in preparing required traffic-flow data and the procedures to be followed in monitoring and modeling.
- The division of responsibilities between developers and reviewers in terms of who monitors and who selects receptor sites.

Prior to addressing the substance of these problem areas, it is important to note that certain problems which impact on the data acquisition process will subsequently be addressed in Section B-2 of this report. These problems relate to the timing of the review (i.e., at which stage projects must in fact undergo ISR), and the reliability of data submitted as part of an ISR application.

a. ISR Guidelines. Florida, Philadelphia, and Oregon have issued guidelines for ISR applicants. These guidelines were either drafted independently or were based on the submission requirements outlined in the Federal indirect source regulations. Florida, which based its guidelines largely upon Federal directives, has cited the need for EPA assistance in understanding the ISR interpretations issued in the Federal Register and in employing proper modeling techniques. According to DPC, the information presented by EPA to explain indirect source review was not detailed enough to be particularly effective. Currently, DPC is expressing a preference for more personal interaction with EPA, such as additional workshops and meetings to discuss ISR. (Training courses were held by EPA, to describe pollution modeling techniques and other technical considerations. At that stage, however, EPA was inexperienced with ISR and all of the problem areas had not been identified.)

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[1] The term "ISR guidelines" here and subsequently refers to materials published by the three state and local review agencies and should not be confused with EPA's Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality.

In Philadelphia, the guidelines for review under the amended regulation are currently restricted to highways and mass transit facilities. It is felt that the requirements of the National Environmental Policy Act (NEPA) should be adequate for an air quality impact analysis. So far, however, environmental impact statements have proven deficient in terms of air quality considerations. Guidelines for other indirect sources have yet to be developed. To date the absence of guidelines for such facilities has not created a serious problem since the projects that have come up for review have been federally funded and, hence, subject to NEPA.

Oregon's DEQ has issued guidelines for new parking facilities and highway projects. The guidelines for parking facilities have been implemented successfully for small parking facilities, which represent approximately 90 percent of the cases submitted so far for review. However, these guidelines are considered to be inadequate for large parking facilities containing 500 or more parking spaces. The guidelines for highways have never been implemented successfully.

There are in essence two types of reviews for parking facilities, depending on the scale of a given project. Projects involving less than 500 parking spaces generally submit site plans for the facility and an outline of a transit-use incentive program. Facilities with 500 or more spaces must generally prepare an environmental impact statement (OEIS)[1] which addresses air quality along with water quality and noise impacts. No more than 10 percent of all parking projects submitted for review are large enough to necessitate an OEIS.

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[1] OEIS refers to the environmental impact statements required under Oregonian law, as distinct from EIS requirements pursuant to NEPA.

The air quality section of an OEIS must address the impact of the parking facility on the surrounding roadnet over time. This involves trip generation assessments as well as analysis of the facility's impact on existing traffic flows. The following topics must be covered:

- Effect of the project on the dependence of the urban dweller on motor vehicles.
- Consistency of the project with local and regional mass transit planning.
- Effect of the project on local and regional mass transit planning.
- Effect of the project on local and regional air quality.
- Effect of the project on local and regional noise levels.
- Effect of the surface runoff from the parking facility.

In addition, a presentation must be made concerning design alternatives that will minimize environmental impact and provide incentives to encourage the use of alternative modes of transportation such as public or private mass transit, bicycles, pedestrian walkways, and water transport.

Oregon has had a comprehensive set of guidelines for the review of proposed highway construction projects since April 1972. The guidelines call for two assessments, to correspond to the two-stage review process. To date the procedures described in the guidelines have not been successfully implemented. The problems relate to the timing of preconstruction review for a highway project. It is the opinion of DEQ that an agency must enter the review process for a large proposed project at least five years in advance of final planning in order to maximize the effectiveness of ISR. So far, highway projects in Oregon have been planned and funded long before the review process became effective. Certain projects which are now pending construction even superseded promulgation of NEPA. DEQ has questioned the legitimacy of its authority to review a project that had been conceived and carried through final planning before indirect sources became an air quality issue.

Since the guidelines for highway projects had not been successfully implemented as of July 1974, DEQ is not sure whether they are reasonable. A revision may be necessary; but without any experience to draw on, an alternative has not yet been formulated. At this point comprehensive regional planning through the land use/transportation plan and the air quality maintenance plan (AQMP) seems to DEQ to offer more potential for control of new highway projects than ISR.

The application of the EPA Interim Guidelines for the Review of the Impact of Indirect Sources on Ambient Air Quality to each of the six case studies analyzed for this report has surfaced some additional problems related to guidelines for data acquisition.

In general, the traffic studies which have traditionally been prepared for private developments are not adequate to provide input to an analysis of localized CO concentrations. The most critical problem relates to the absence of a discussion of roadway capacity as opposed to roadway volume. Most traffic studies focus on existing and projected traffic volumes by road. They fail to relate these volumes precisely to the capability of the road to absorb the traffic. The measurement of localized CO concentrations using the EPA technical guidelines requires accurate volume/capacity ratios by lane, together with good information on signalization parameters.

Further general deficiencies relate to the area analyzed within the vicinity of a given facility and the presentation of the road configurations. Federal ISR requires analysis of all principal roadways within a quarter mile of the indirect source out to the quarter-mile periphery of the site. However, one may need to go beyond the quarter mile in order to develop the necessary understanding of traffic flow patterns within the general vicinity of a facility. Most traffic studies, nevertheless, only focus on impacts occurring close to the site.

Specific data deficiencies of typical traffic studies are outlined below:

1. Existing Traffic Volumes
   - Presented as 24-hour average daily traffic rather than in peak one-hour or eight-hour volumes.
   - No breakdown of traffic volume by lane on a given roadway.
   - No breakdown of traffic volume by direction on a given roadway.
   - No discussion of turning movements on a given roadway.
2. Traffic Signalization
   - Generally omitted.
   - If included, the timing and type of signal are not discussed.
3. Mass Transit
   - No discussion of service frequency.
   - No ridership projections with usage during peak periods of the day.
   - No explanation of transit routes.
4. Traffic Volume Projections
   - Average growth rates are used rather than ones designed to accurately project conditions and planned development within a specific area.
   - No flexibility for any change in the scale of a project.
   - No breakdown by different development phases of multi-staged project.
   - Time frames and projections do not correspond with EPA requirements for impacts one year after the facility is operational.

b. Developer/Reviewer Responsibilities. Reducing the ambiguities in terms of responsibility for various steps during the data acquisition stage could eliminate some of the problems associated with reliability of data. Reliability problems are discussed in detail in Section B-2. The most frequently raised issues relating to data collection are who should monitor and who should select receptor locations. As an example of the monitoring issue, AMS in Philadelphia is sensitive to the inability of certain parking garage owners to finance data collection and preparation, especially the monitoring requirements. Although the situation has yet to arise when a prospective applicant could not pay for preparation of the review applications, AMS has expressed its willingness to share the burden of meeting the review data requirements.

Although the economic impact analyses documented in this report show that the preparation of an application is of minor financial consequence to a developer, none of the developments analyzed were free-standing parking facilities in downtown areas. The operators of such facilities may have limited equity funds for use in financing the preparation of an ISR application.

The issue of selecting receptor sites has created some confusion among developers in Florida. The source of the confusion may be eliminated with the publication of EPA guidelines for choosing receptor locations (to be issued during the fall of 1974). However, identifying future land use plans which may be important in projecting receptor sites will probably still be a problem. Reviewer guidance to developers may be particularly useful in resolving any questions on identifying future receptors.

2. Application Preparation and Submission

The Federal EPA position on the preparation and submission of an ISR application is to encourage early review. The burden falls on the developer to approach the review agency to determine the requirements of an application and the acceptable methodologies for an evaluation of localized CO concentrations. The information is available upon request.

The analysis of the three state and local experiences surfaced several key issues related to application and submission. These concern the point during the development process at which the developer submits an application, the review of developments not specifically covered by the regulations, and the reliability of data submitted for review. Problems were also identified regarding foreknowledge of the review process, although these are generally of short-term consequence.

a. Timing -- When ISR Is Initiated. The point at which the review process is initiated may have a substantial impact on a developer's financial position. In order to understand the developer's peculiar predicament regarding ISR, it is necessary to become familiar with the development process and the developer's level of commitment to a project at each step.

(1) The Development Process. Real estate development involves an intricate coordination of decisions and actions. The major steps in the overall process, from the initial conceptualization to the start-up of construction, are presented in Exhibits V-2, V-3, and V-4 for each type of development analyzed in this study: shopping center, office park, and mixed-use project.

The exhibits outline the general approach to development. The development procedure varies considerably depending on the type and size of the project involved, the size and nature of the development company, and the new trends within the industry. As an example, the traditional sequence of performing a

EXHIBIT V-2
SHOPPING CENTER DEVELOPMENT

Reasonable Risk Costs of Business Development

I. Perform Market Analysis
  A. Investigate Demand for Commercial Development
  B. Conduct Initial Demographic Work on Area and Site
  C. Consider Trade Area and Buying Power
  D. Measure Status of Competition
  E. Analyze Direction of Urban Growth

II. Conduct Locational Analysis
  A. Seek Available Property (Real Estate Broker)
  B. Examine/Select Geographic Area
  C. Identify Property (or Alternatives)
  D. Perform Site Evaluation
    1. Location and Access
    2. Size and Shape
    3. Topography and Physical Characteristics
    4. Utilities
    5. Favorable Zoning
  E. Consider Traffic Patterns

III. Conduct Site and Technical Preparations
  A. Obtain Option on Tract of Land
  B. Propose Location to Major Department Stores
  C. Determine if Site Satisfies General Criteria of Department Stores
  D. Hold Preliminary Meeting with City Zoning Administrator
  E. Present Precise Pre-Zoning Plan for Review and Permit
  F. Commence ISR-related Studies
    1. Commit to Traffic Study Costs
    2. Examine Viability of Access
    3. Determine Air Quality Impact

Significant Cost and Commitment Breaking Point

(Preferred Point for Indirect Source Review)

Major Costs Committed on Faith of Approvals

IV. Arrange Development Planning
  A. Assume ISR Preparation Costs
  B. Achieve Annexation into City
  C. Undergo Zoning Presentation
  D. Acquire Variances if Already Zoned for Commercial (Car Count, Magnitude, etc.)
  E. Hire Engineer for Boundary Survey and Topographics
  F. Conduct Soil Tests
  G. Engage Traffic Engineer
  H. Present Precise Plan for Review
  I. Acquire EPA and Other Applicable Approvals

EXHIBIT V-2 (Cont'd)

Major Costs Committed on Faith of Approvals

J. Negotiate Architectural Contract for Site and Buildings, and Contact Likely Department Store Tenants
K. Meet with City or County Concerning Utilities
L. Examine and Approve Pro Forma
M. Finalize Soils Investigation
N. Locate Department Stores on Plot Plans (Process Could Take Several Months)
    1. Prepare Business Letters for Major Department Stores
    2. Indicate to Department Stores the Costs for the Ground
    3. Arrange Stipulations in Exchange for Developers' Obligations
O. Work on Real Estate Analysis (by Attorneys) (Process Could Take Eight Months)
    1. Complete Purchase of Property if Not Already Done
    2. Secure Grading Permits, if Required.
P. Arrange Permanent Financing
    1. Expose Proposal to Lenders
    2. Execute Application for Loan and Permanent Loan Commitment
    3. Put up "Good Faith" Deposit (Normally 2 Percent of Loan Amount)
Q. Locate and Arrange with Interim Lenders
R. Award Site Grading Contracts
S. Let Construction Contracts
    1. Requires Removal of Significant Dollar Amounts from Bank
    2. Can Occur at Any Time
T. Have Project Coordinator Assume More Detailed Management
    1. Specify Actual Parking Areas
    2. Indicate Off-Site Improvements
    3. Negotiate Street and Road Considerations with City and County
U. Apply Architectural Design to Building Mass
V. Have Real Estate Broker Become Leasing Agent
    1. Specifies Likely Occupancy in Layout of Space
    2. Indicates Type of Use
    3. Establishes Rental Structure
W. Lease and Occupy
X. Stock and Employ Operating Personnel
Y. Open Shopping Center

Source: James A. Cook, Executive Director, California Business Properties Association, 1974.

EXHIBIT V-3
OFFICE PARK DEVELOPMENT

Reasonable Risk Costs of Business Development

I. Perform Market Analysis
  - A. Determine Office Space Demand
  - B. Analyze Current Economic Climate and Future Projections
  - C. Conduct Demographic and Job Market Studies
  - D. Investigate Trade Area
  - E. Consider Direction of Urban Growth

II. Conduct Locational Analysis
  - A. Note Accessibility to Roadways
  - B. Consider Relationship to CBD
  - C. Evaluate Quality of Surroundings
  - D. Compare Cost of Land
  - E. Analyze Suitability of Site
    - 1. Shape and Size
    - 2. Topography
    - 3. Utilities
    - 4. Zoning

III. Conduct Site and Technical Preparations
  - A. Obtain Option on Tract of Land
  - B. Contact Local Agencies
    - 1. Planning Agency
    - 2. Zoning Administrator
    - 3. Environmental Control Agency
    - 4. Municipal Engineer
    - 5. Building Inspector
  - C. Conduct Preliminary Engineering and Traffic Surveys
  - D. Prepare Preliminary Land and Site Plans
  - E. Prepare Preliminary Architectural Drawings

Significant Cost and Commitment Breaking Point

(Preferred Point for Indirect Source Review)

Major Costs Commited on Faith of Approvals

  - F. Secure Title Clearance
  - G. Obtain Zoning Changes, if Necessary
  - H. Inquire About Building Permit Requirements

EXHIBIT V-3 (Cont'd)

Major Costs Committed on Faith of Approvals →

IV. Arrange Development Planning
   A. Determine Type of Office Park
   B. Conduct Final Traffic Studies
   C. Acquire Land
   D. Approach Prospective Clients
   E. Analyze Pro Forma for Feasibility of Development
   F. Indicate Costs and Contact Tenants
   G. Finalize Financing
   H. Prepare Final Engineering Studies
   I. Finalize Architectural Plans
   J. Secure Building Permits
   K. Conduct Site Grading Improvements
   L. Determine Rental Structure and Leasing Arrangements
   M. Begin Construction in Phases
   N. Continue Leasing Space
   O. Begin Tenant Occupancy in Phases

Source: Harbridge House, Inc.

EXHIBIT V-4
MIXED-USE DEVELOPMENT

Reasonable Risk Costs of Business Development

I. Perform Market Analysis
   A. Analyze Demand for Housing, Office, Commercial, and Recreational Space
   B. Carry Out Demographic and Economic Survey
   C. Analyze Trade Area and Urban Growth Areas
   D. Consider Occupation and Income Levels
   E. Determine Optimum Tenant Mix

II. Conduct Locational Analysis
   A. Note Roadway Access and Transportation Facilities
   B. Consider Location Within Urban/Rural Area
   C. Compare Cost of Land
   D. Determine Suitability of Site
      1. Size and Shape of Tract
      2. Topography
      3. Drainage
      4. Utility Services
      5. Zoning Categories
   E. Evaluate Site Environment
      1. Land Use
      2. Traffic
      3. Airport Location
      4. Flooding
   F. Note City Services and Community Facilities
   G. Check Municipal Regulations

III. Evaluate Site and Technical Preparations
   A. Obtain Option on Tract of Land
   B. Contact Local Agencies
      1. Planning Agency
      2. Zoning Administrator
      3. Environmental Control Agency
      4. Municipal Engineer
      5. Building Inspector
      6. Federal Housing Administration
      7. School Board
   C. Conduct Preliminary Engineering and Traffic Surveys
   D. Prepare Preliminary Land and Site Plans

Significant Cost and Commitment Breaking Point

   E. Prepare Preliminary Architectural Drawings

   (Preferred Point for Indirect Source Review)

   (Preferred Indirect Source Air Quality Approval)

   F. Secure the Title Clearance
   G. Obtain Zoning Changes, if Necessary
   H. Inquire About Building Permit Requirements

EXHIBIT V-4 (Cont'd)

Major Costs Committed on Faith of Approvals

IV. Arrange Development Planning
   - A. Determine Most Feasible Mix for Development
   - B. Conduct Final Traffic Studies
   - C. Acquire the Land
   - D. Approach Prospective Tenants
   - E. Analyze *Pro Forma* Statements for Feasibility of Development
   - F. Determine Costs and Contact
   - G. Arrange Permanent Financing
   - H. Prepare Final Engineering Studies
   - I. Prepare Final Architectural Drawings
   - J. Secure Building Permits
   - K. Conduct Site Grading Improvements
   - L. Address Street and Grading Improvements
   - M. Determine Rental Structure and Leasing Arrangements
   - N. Begin Construction in Phases
   - O. Continue Leasing Space
   - P. Begin Tenant Occupancy in Phases

Source: Harbridge House, Inc.

market analysis followed by a locational analysis is currently being eliminated by major tenants who are approaching developers and asking them to build a center on a site they have already selected themselves.

Timing is critical at various steps throughout the process. In addition, the major steps not only interact in a sequence, but also in relation to their duration. A carefully planned schedule will allow some steps to be carried out simultaneously and others to overlap. While a degree of flexibility should be provided in the schedule, extended delay at any point in a project would impact on all other points in the development process. This, in turn, would affect the cost of a project--sometimes quite dramatically.

The relative position of ISR is shown in each of the development process charts. ISR has been inserted prior to the significant cost and commitment breaking point. However, extensive delay resulting from ISR could incur significant excess costs by upsetting the schedule of interlocking activities. Often, excessive delay will require more than just a rescheduling of activities farther into the future; it can also mean that several complementary activities must be realigned.

(2) Private Development Applications. The following comments on the initiation of ISR are based on the three state and local experience studies and are restricted to private development projects. Highway projects are discussed separately in the section that follows.

Most developers submit ISR applications to Florida's DPC at a stage when their design plans are fairly well formalized. Yet the major commitments, such as financing, road improvements, or groundbreaking, are not finalized at this point. However, a trend is evolving where developers solicit ISR at an earlier stage in their design plans as they become more familiar with the review procedure.

ISR generally occurs at the same time that zoning, water, sewage, and other required permits are being sought. The timing is most critical when developers apply for ISR after their design plans are well established. Moreover, timing is critical at any stage if the length of the review process exceeds expectations and scheduling of all subsequent steps in the development process is adversely affected.

DPC also allows some flexibility in the scale of projects submitted for review. This enables a developer to submit an application prior to knowing the exact specifications of his development. A design flexibility factor of 10 percent is generally permissible. If a developer cites the need for a design flexibility factor, DPC will accept this for ISR provided CO concentrations are projected for the maximum size of the development.

In addition to ISR, a Florida development may be subject to review as a Development of Regional Impact (DRI) under the Environmental Land and Water Management Act. DRI is defined as a development which affects the citizens of more than one locality because of its character, magnitude, or location. The Bureau of Land and Water Management within the Division of State Planning administers this program. DRI became effective on 2 July 1973, six months before ISR was promulgated in Florida.

DRI is broader in scope than ISR, but the two overlap. Whereas ISR is concerned with the impact of new facilities on air quality, DRI focuses on the total set of social, economic, transportation, and environmental impacts that may be generated by a new development. The triggering points for DRI are generally above those for ISR. In the case of a shopping center, the facility would be subject to Florida ISR if parking was provided for 1,500 or more cars (750 or more cars in multilevel parking lots); it would be subject to DRI if parking was provided for more than 2,500 cars.

Requirements for the review of air quality are duplicated in DRI and ISR applications. This is especially true since, to date, all developments which have applied for ISR permits have been of sufficient scale to also require application for DRI approval. DRI currently requests a minimum of air quality information as part of its review. However, major developers frequently submit DRI and ISR applications simultaneously in the same report. They see no reason why both decisions cannot be rendered concurrently.

In one instance, a bottleneck was created between the two programs. An ISR application was rejected by the local DPC office because the facility lacked DRI zoning. The locality responsible for DRI approval decided that it could not be granted until ISR had been obtained. The local DPC-designated review agency made the same stipulation concerning DRI. Even after the state DPC environmental lawyer suggested to the local agency that ISR be granted, conditional upon DRI approval, the ISR application was rejected for lack of DRI zoning.

More typically, however, the local agency receiving the DRI application refers the air quality section to DPC for analysis. Although the requirements for data and analysis are the same, two separate reviews of the findings take place. The duplication of effort in air quality review does not seem to be an issue on the part of DPC or DRI officials. Rather, they cite the political complications of a possible merger of the two programs. According to these two agencies it would not be reasonable to implement effectively such a step.

As evidenced by the ISR permit denial described above, the coordination of several review processes can create problems for developers in terms of when they can initiate ISR procedures. In states or localities where more than one review process is necessitated for a private development, the ISR agency should be flexible and allow its review to occur concurrently with those of other agencies.

Philadelphia's AMS has yet to initiate official review procedures on any private development projects. It is monitoring all projects that will ultimately be subject to review, and is encouraging the developers and/or responsible agencies to come into AMS very early in the planning stages in order to expedite review procedures later on. AMS is anxious to grant a review decision as soon as the project's owner or the responsible agency can provide adequate information for an air quality impact analysis. The agency wants to cause the least amount of disruption in the development process and yet achieve a reasonable assessment of air quality considerations.

At the moment, in Oregon the timing of ISR does not appear to be a problem for private developers. Most developers come in early in the planning process, obtain answers to their questions, and proceed with the preparation of an application.

There were some timing problems when the state first started implementing its regulations. There were instances where localities which desired a particular development for the contributions it would make to tax base and employment, granted the necessary zoning change but did not inform the developer that an ISR permit was needed. In some cases construction was actually started before the developer ever learned that ISR was necessary. Subsequently, and even with construction under way, DEQ has required developers to go through the application process. So far no one has resisted this "late" review, although the benefits of the process in terms of design change alternatives are minimized. As more reviews have been undertaken, both developers and financial institutions have become more familiar with the ISR regulations, thereby reducing the occurrence of late reviews.

In general, DEQ prefers that developers come in for review after going through the zoning process; the purpose of this is to support the local position on a project. If ISR precedes a zoning change, the local agency responsible for land use may feel pressured into a decision because of ISR approval. To prevent an unnecessary burden, especially time delay problems for the small developer, in particular cases DEQ will undertake a review which is simultaneous with the zoning process.

A number of counties require an ISR permit before a building permit can be issued. Financial institutions are also assuming an ever greater support function in requiring an ISR permit before entering into financial negotiation.

(3) Highway Applications. In the case of highway projects, DPC has been experiencing some timing conflicts with the state Department of Transportation (DOT). In order to apply for Federal highway aid from the Federal Highway Administration (FHWA), DOT must submit a "letter of consistency" signed by the Florida DPC. This letter signifies that the proposed roadway is consistent with the air implementation plan for the state.

The plans for major highways are generally developed eight years before the road is actually in place. Relocation and right-of-way purchases occur approximately four years before the highway is completed. The funding procedures for these roadway projects must also be determined early in the planning process.[1]

The conflict between DOT and DPC arises over this timing issue. DPC does not want to authorize that a proposed road is consistent with Florida's air implementation plan without first witnessing a successful ISR. In order for the CO monitoring and traffic projections to be developed in sufficient depth for indirect source review, the plans for the highway must be reasonably well established. This condition cannot be realized by DOT, however, until FHWA grants funding to sponsor plans and implement the DOT project.

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[1] FHWA establishes a comprehensive transportation planning process for each urban area in the United States. The funds are appropriated before 31 December of each year and are generally available by 1 July of the following year (1.75 percent of the FHWA funds is directed to planning and research procedures). DOT bills FHWA for road construction funds on a project-by-project basis.

This conflict has not been adequately solved by either agency. Currently, DPC issues a letter of consistency to FHWA which is dependent on successful ISR at later stages. DOT would welcome a conditional ISR approval at the very early planning stages, with yearly CO projections developed by computer modeling.

AMS is working closely with agencies responsible for highway projects to establish procedures for the review of highway facilities. Problems are foreseen over the near term. As most urban highway projects require a minimum of seven years of planning prior to construction, many of them would be in the development process before the review program is implemented. The ISR and FHWA requirements would not interface smoothly until all projects planned prior to implementation of review are constructed or dropped. Until such time, indirect source reviews of these projects would be occurring much further along in the development process and, therefore, according to AMS officials, might be resented by the state transportation agencies. AMS is actively trying to resolve these problems with those agencies who might ultimately submit applications with timing problems.

In Oregon, timing has generally been a much more critical issue for highway projects than for private developments. Time with respect to the A-95 process[1] is of particular importance. DEQ has found itself under pressure to complete ISR upon receipt of A-95 notification. Yet the information available from A-95 on the traffic impact of a proposed project is much too limited to permit an indirect source assessment. The state DOT, however, cannot undertake detailed planning and traffic engineering studies suitable for ISR until funds have been granted, and funds will not be allocated until A-95 approval (or no comment) has been received.

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[1] A-95 refers to OMB Circular No. A-95 issued in response to the Intergovernmental Cooperation Act of 1968. Under its directives all capital grant applications for transportation projects must be submitted for review and comment to both the state and regional or metropolitan clearinghouses. These clearinghouses will inform all other appropriate agencies or local governments, examine the project from the comprehensive planning point of view, and arrange for any necessary follow-up conferences with the applicant and interested agencies or local governments. With regard to the environmental impacts of the project, the clearinghouse is expected to inform any state or local agencies authorized to develop and enforce environmental standards, invite their comments on the environmental impact of the project, and transmit such comments to the applicant.

The second stage in the highway review process comes with the submission of design alternatives pursuant to the Federal Highway Administration guidelines set forth in Policy and Procedure Memorandum 90-1. At this stage of the process, however, not only is there strong (political) momentum to push ahead with the project, but many of the design change options may already have been precluded without determination of their impact on air quality. Consequently, DEQ feels that it is being forced to play the role of the "bad guy" in highway-related cases. If it does not give approval at the A-95 stage, it is accused of killing the project. However, if DEQ attempts to initiate review at a later stage, it faces heavy criticism for causing delays. Political pressure is sometimes brought to bear on the DEQ as well.

b. When ISR Applies. Ambiguities have arisen in Florida over when the review process does and does not apply. DPC has issued guidelines for size criteria to determine which facilities must undergo ISR. Yet, it also has the authority to require review for developments which are smaller than those specified by the criteria but which, nevertheless, may present a potential pollution problem.

If a developer is not sure whether his project will require review and if he is anxious to avoid additional front-end costs should review be imposed at a point in the development process fairly close to construction, he may apply to DPC for a "letter of exemption." A developer may also request a letter of exemption to provide partial assurance to a lending institution that his facility is acceptable to all regulatory agencies.

The developer generally only submits a site plan to DPC with a description of the surrounding land use. An informal review is conducted between DPC officials who are familiar with the area and the developer to determine whether the project will pass ISR. If any doubt exists, the developer must submit the information required for a regular ISR, and a more detailed analysis of the project is undertaken. The formal ISR procedures are not required, however, unless it is determined that the proposed facility will cause a violation of CO standards or that it reaches the triggering point for review.

The letter of exemption signifies that the proposed facility will not be a major indirect source of air pollution and that it does not require ISR. Approximately 10 letters of exemption have been issued in Florida so far.

c. Reliability of Data. Most of the conflict in analyzing Florida's applications revolves around the issue of the reliability of emission and traffic data. The assumptions made for calculations in ISR, such as the formulas for CO readings and the calibration of emission and load factors, are often questioned. However, DPC lacks the funds to carry out independent studies for ISR.

The validity of the traffic projections is another point of contention. The reliability of traffic counts and vehicle speed readings is sometimes challenged. Standard design considerations for entrance and egress roads to a facility must also be established.

Monitoring for only one week out of the year is a further point of discussion. Because of the impact of the tourist season, Florida experiences strong seasonal fluctuations of population and associated air quality levels. The winter population count is much higher than the summer count, and traffic and pollution counts could rise accordingly.

The Florida ISR guidelines specify a monitoring period of no less than seven days. However, some parties have questioned this procedure, since it is not known what degree of accuracy can be achieved in seven days of CO monitoring as compared to a period of any other duration.

ISR applications for developments in areas with obviously low pollution levels are often submitted without any monitoring data at all. In some cases, DPC has accepted these applications or has allowed projection of pollution levels by computer models.

The depth of the air quality impact analyses being performed in Philadelphia is a problem because the responsible agencies are not providing adequate detail. The assumptions used in determining methodological techniques and making traffic projections are not included; thus, there can be no assessment of the validity of the assumptions. When assumptions are provided, there is inadequate explanation and justification.

AMS is also concerned about background air quality data. The agency would like to use monitoring data that are known to be of high quality (i.e., from reputable laboratories). AMS would compare the findings of an air quality analysis with data derived internally for nearby locations to assess validity.

DEQ has raised questions concerning the data presented in support of highway projects. The assumptions used for traffic projections are sometimes considered erroneous because they may be designed to support highway development based on biased land use trip generation and/or origin-destination data. The gravity model used by the Oregon DOT also appears to be based on an unrealistically high growth rate. Furthermore, it incorporates only a limited allowance or no allowance at all for modal splits. DEQ also feels that the capacity figures cited for existing roadways are often too low. Highways with a designated capacity of 30,000 vehicles (average daily traffic) are in actuality operating smoothly with 32,000 vehicles. The designated capacity figures, therefore, would support new roadway construction.

d. Foreknowledge of ISR. Developers have learned about ISR from varying sources and at varying stages in their development plans. In Florida the local planning agencies serve as valuable sources of information for DPC by revealing potential developments which may require ISR. Other local permitting agencies, such as those for zoning and water, are also in a key position to inform both developers and DPC about projects requiring review.

The local planning agencies also develop study maps showing land use and density in their area of jurisdiction. These maps can help to identify the location of present and future critical receptors. DPC cites these maps as informative guidelines for the location of development. However, some developers complain that the maps are not detailed enough to anticipate future problem pollution areas.

The local and regional agencies serve as a sounding board for developers anticipating ISR. Prior to the finalization of design plans, such issues as traffic demands and alternatives as well as pollution and zoning regulations are discussed with the local planning board. The Broward County Planning office, in fact, has a computer program to project emissions; this could be a valuable tool in the ISR process.

AMS in Philadelphia has undertaken a campaign to inform impacted parties of the Regulation X review process. It is also working on gaining the support of the Philadelphia Bureau of Licenses and Inspection (L & I). This agency issues all permits to builders. AMS would like L & I to demand that a developer submit an ISR approval letter prior to receiving a building permit. Finally, AMS has developed close ties with the state clearinghouse through the Pennsylvania Department of Environmental Resources and the local clearinghouse (the Delaware Valley Regional Planning Commission). These agencies supply information on proposed projects which AMS could follow up if ISR were applicable.

DEQ in Oregon has experienced problems because certain developers were unaware of the review process. Some reviews had to be performed after construction of a project had started. Others are learning about the review just prior to getting a building permit. At that point in time, a review can be most expensive to a developer.

In retrospect, it is the opinion of DEQ that if it had an opportunity to start the program again, its first step prior to the effective date would be to send out information bulletins on the purpose and nature of the regulations to every developer who has worked in or is located in the state, to all architectural and engineering firms operating in the state, to financial institutions, and to realtors.

3. The Review Process

As shown in Exhibit V-1 Federal ISR is designed to take 90 days. The review period is subdivided into three 30-day sections: preliminary determination (until receipt of a complete application), public comment, and final decision. Each of these three stages may be lengthened an additional 30 days at the discretion of the review authority. The review process, therefore, could take up to 180 days, Any time above and beyond the 180 days would be subject to negotiation between the applicant and the reviewer.[1]

Two major problem areas arise in conjunction with the review process itself. First is the length of time it takes. Extended reviews can have substantial economic consequences for a developer due to inflationary increases in construction costs. However, reviewers cite inadequate manpower as a reason for the backlog in processing ISR applications. The second problem relates to who performs the review and at what level. If more than one jurisdictional level (that is, state and regional or state and local) is involved, problems may arise in the consistency and equity of review procedures.

a. Timing--Duration of ISR. The following discussion focuses on how long the review process is supposed to take in each state by comparison with the actual time required for each of the three experiences.

In Florida, a review process is supposed to take place in 65 days prior to a public comment period, which runs for an additional 30 days. The breakdown is as follows:

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[1] 40 CFR 52.22 (b) (8) (vi).

ISR Procedure	Time Required
Preliminary review of application by regional DPC (returned if more information is required)	7 days
Technical review by local DPC	14 days
Public review of indirect source	30 days
Final evaluation by regional DPC	14 days
Total	65 days

In Philadelphia, once the owner or agency responsible for a project is ready to submit an air quality impact analysis, AMS has a maximum of 60 days to review the document and make a decision. The project in question can be approved or disapproved, or the responsible agent may be asked to submit more detailed information at the conclusion of that 60-day period.

Theoretically, a review will not exceed 60 days if the submitting party has performed an air quality impact analysis in compliance with AMS evaluation criteria and if that analysis reflects the proposed project's compatibility with the maintenance of air quality standards. The review is then followed by a period of 30 days, minimum, for public comment. The developer or agency responsible for the review must finance the advertising costs.

In Oregon, projects are allowed 60 days for review. DEQ has tried reduce the review process to 30 days, maximum, from the time public notice is issued in order to accommodate local developers. In the case of regional air pollution agency involvement, the maximum time period allowed is also 60 days. The regional agency should make its recommendation to DEQ within 21 days of the receipt of materials. Thus, DEQ would have 30 days remaining for its decision, although it tries to respond much more quickly.

DEQ is aware of the great importance of speedy review, especially in a state with a limited construction period. Construction activities are generally curtailed in Oregon from November through February. In addition, heavy rains restrict paving to only three months of the year. An untimely delay could force a developer to postpone his work for several months and his paving for almost a year. Early review should help to prevent this problem if the developers can and do take advantage of the opportunity and do not overload the review staff with applications at a point just prior to the start of a new construction season.

Florida's indirect source review has involved a time period ranging from 65 to 240 days, depending on the availability of information which the developer includes in the application, the length of the technical review, and any controversies that might arise during the period of public comment.[1]

ISR could conceivably occur in the 65-day time frame already described--although to date this timing has only been met for highway projects. Highway projects generally average 81 days from the date the application is received by DPC to the date it is issued; shopping center permits require an average of 170 days for issuance, a period considered too long by private developers.[2]

The actual timing of AMS's reviews is summarized below:

Project	Air Quality Submission	Date of Comments
National Historic Park	Early November 1973	23 November 1973
Expressway	15 May 1974	9 July 1974
Road Widening	28 June 1974	Mid-July to End of July 1974

To date AMS has been successful in meeting the 60-day time limit. It is important to note, however, that at the conclusion of the 60-day period the project was not necessarily approved for construction.

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[1] Regional DPC offices, "Complex Air Source Log Sheets," July 1974.

[2] Ibid.

Oregon's DEQ has tried to achieve its goal of reviewing each application within 30 days of receipt. Some reviews, however, have taken longer--although none of them has exceeded the 60-day limit from the time of submission of materials delineated in the guidelines to a decision by DEQ or the Environmental Quality Commission (EQC). In cases where insufficient data for ISR are initially submitted, the applicant is immediately informed and the review completed--usually within 30 days--after receipt of the additional information.

Time delays,therefore, have impacted developers in Florida more severely than in Philadelphia or Oregon. Two reasons can explain the shorter length of time involved for ISR of Florida highways. First, DPC usually provides the CO monitoring information, thereby eliminating additional time and costs for this purpose. Second, new or modified highways in Florida, often located in low-density areas, generally incite less opposition than large shopping centers in heavily traveled areas. In addition, DPC cites inadequate staffing as a cause of time delays.

Each region receives an average of one or two ISR applications per week, and each application requires two to four days for review. Highway applications require more DPC staff time, since DPC is generally responsible for the monitoring of air quality in addition to the normal application review. The number of applications received each week is fairly consistent because Florida's weather allows for construction all year long.

The source sampling teams, which are based in the state DPC office, rotate from region to region in Florida. The staff at the regional DPC offices, however, do not rotate to balance any periods of slack or excess numbers of review. The extreme work load in each of the regions is the explanation given by the Division of Air, Solid Waste, and Noise for this procedure.

Inadequate staffing for review purposes has already created some problems. The West Coast Region, for example, received several applications at one point and was delayed four months in reviewing one particular application. Two additional environmental specialists and two engineers will join this regional DPC staff, so that the lag in processing should be remedied.

In Florida the Division of Air, Solid Waste, and Noise, which oversees DPC, requested funds from the Florida Legislature for 55 additional employees, intending to appropriate seven of them for ISR (one in each region and one in the state office). The requested funds, however, have not been granted.

Oregon's DEQ is also in need of additional staffing. Some of the need can be attributed to enforcement and will be discussed in a later section. Ideally, DEQ would like to hire three additional full-time people for ISR. One person would work exclusively on review enforcement; the other two would work on reviews of smaller Portland projects and those submitted through the two regional air pollution control agencies for the Eugene and Salem areas.

DEQ has two people whose time is devoted exclusively to the review process. The reviewers are trying to accommodate developers by responding to applications within 30 days. They realize the limitations of Oregon's construction season, particularly the limited time available for paving, and are sensitive to the developer's need for a quick decision.

The two reviewers at DEQ spend most of their time analyzing applications. The volume of applications is heaviest during the spring when DEQ averages 20 per month. The reviewers are also responsible for enforcing the conditions in the permits and interacting closely with other state, regional, and local agencies. Aside from their normal duties, they feel that reviewers should be properly versed in modeling techniques and should be available to assist localities outside the three main Oregon cities, such as Beaverton, with parking plans. There is little time for these additional skills and functions.

A summary of the current staffing situation and desired staffing requirements for the three state and local experiences is shown in Exhibit V-5. This exhibit also addresses the volume of applications within each review agency.

b. State versus Local Review. EPA has adopted a position which encourages review at the local level whenever state air quality offices feel that there is sufficient manpower and technical ability to permit the delegation of this function. This position is based upon the premise that reviewers at the local level are most familiar with problems and issues that might arise in attempting to implement ISR equitably and efficiently.

The EPA position is born out in the experience of Philadelphia's AMS. The Penn DER has been very supportive of AMS and its right to review Philadelphia projects. Theoretically, AMS has autonomy over its review, although the state could intervene and override an AMS decision. Penn DER, however, is heavily reliant on AMS's perception of the Philadelphia situation and prefers to defer to the local agency on air quality problems in that city.

Some developers, and even some review officials take a more cautious position regarding the local implementation of ISR. The reasons given are based on concern over the lack of technical expertise at the local level and the tendency to bypass air quality considerations because of social, economic, and political pressures.

Primary responsibility for the administration of Florida's ISR rests with the state DPC. All applications are reviewed by the approved local pollution control agency in the project area and the permit is issued by the regional offices of DPC. The regional DPC will not grant ISR approval, however, if the local review office or locality objects.

EXHIBIT V-5
ISR STAFFING.

State of Local Experience	Existing Reviewers	Average Volume Applications Reviewed	Additional Personnel
Florida (by DPC regional office)	1-2	2-3 per week	1
Philadelphia	1*	3 (November - July 1974)	-
Oregon	2	up to 20 per month	2-3**

*Could be increased to 6 depending on scale, complexity, and controversial nature of project.

**Besides reviewing applications, these additional people would be involved in other aspects of ISR such as enforcement.

Two regional agencies are also involved in the review process: Lane Regional Air Pollution Authority, which represents the Eugene metropolitan area, and Mid-Willamette Valley Air Pollution Authority, which covers Salem. There is no longer a regional air pollution authority for the Portland area since the Columbia-Willamette Pollution Authority was disbanded as of 1 July 1973.

In essence, the Eugene and Salem regional air pollution agencies perform the reviews. However, these agencies do not have autonomy. They pass along their recommendations to DEQ, which issues the final approval or disapproval. Within DEQ there are differences of opinion regarding whether the regional air pollution agencies should be given authority to review projects autonomously. One approach under consideration is for DEQ to limit its involvement at the regional level to large-scale projects.

Another state versus local review concern is the question of which agency or program should issue the final approval or permit of the several required to go ahead with a project. As a number of developers put it, "Every agency wants the right of final review. [As a result] we keep running around in circles, without anything getting approved."

Developers hope that local reviewers will follow EPA's position regarding early review so that this particular problem can be avoided.

4. Public Comment

Under the Federal regulation the public is allowed 30 days to respond in writing to the information submitted by the developer to the review agency and to the review agency's preliminary determination. The public must be informed of the proposed indirect source construction through prominent advertisement.[1]

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[1] 40 CFR 52.22 (b) (8).

Problems may arise in regard to comments that address issues other than the impact of a proposed indirect source on CO concentrations. Developers also question the need for public comment pursuant to a preliminary disapproval or the need for a public hearing (if a state regulation incorporates this requirement) in addition to the submission of written comments. Finally, timing problems may arise if a public hearing is required in response to "significant adverse public comment" or if a developer wants to appeal a negative decision on an application.[1] The question is related to whether those states instituting ISR would consider an appeal without an intervening public hearing if the results of a technical review were unfavorable. In the opinion of certain developers, such a procedure would help to reduce one source of time delays--a critical factor for the real estate industry. (The impact of timing in terms of ISR duration has already been addressed in the previous section on the review process.)

Florida is the only one of the three state and local review agencies analyzed which experienced difficulties during the public comment period. In Philadelphia and in Oregon, the public projects reviewed were in certain cases subject to public comment or public hearings pursuant to other regulatory requirements. Private development projects in Oregon are in the large majority of cases under 500 parking spaces and generally too small to arouse controversy.

The public notice procedure for Florida corresponds to that for Federal ISR. Upon notification of the proposed DPC decisions, the developer is responsible for publishing a public notice in the area where the facility is to be located. Public comments in response to the notice must be made within 30 days. If a negative decision on an application is announced after the technical review is completed, the developer must appeal within 10 days for a public hearing to be called. It is also unwritten policy in Florida that a public hearing may be held if "significant adverse public comment" is received. In either case, a date is set and the facts of the case are reviewed to determine whether there is sufficient justification for revising the decision.

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[1] It should be noted that there is no specific provision for an appeals process in the Federal indirect source regulations.

5. Decision

According to Federal ISR, at the conclusion of the public comment period the review agency is allowed 30 days to issue a final decision on a proposed indirect source application. The decision would take the form of an approval, an approval with conditions, or a disapproval.

The development community is primarily concerned about conditioned approvals and disapprovals. If a developer receives a disapproval, he might appeal the decision or perform further analysis to verify that his project did not violate NAAQS for CO. This raises the issue of the reliability of emissions or traffic data (see page V-30). The developer might consider redesigning his project. He could reduce the total scale of the development or assess possible new design features to facilitate traffic flows. All of these options require additional time which may be very costly to the developer (see Section B2).

Another possibility is to immediately stop further work on the project. Each developer has certain limitations in terms of how much of his own equity he can invest in a project and how long he can afford to tie up that equity without realizing a return on the investment. The small-scale developer is most vulnerable since he cannot rely upon the income generated by other successfully completed projects. Support from the financial community is also more limited than in the case of a large, well-established developer.

Florida is the only one of the three state and local experience cases where ISR disapprovals have been issued. Philadelphia and Oregon, however, have both issued conditioned approvals. By July 1974, DPC had disapproved two shopping centers. According to the environmental lawyer at DPC, one application was denied because DPC projected that CO concentrations along a roadway near the proposed mall would violate NAAQS. The second application was rejected by the local DPC office because the facility lacked DRI zoning. This latter case was previously described in Section B2.

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Although disapprovals are a recognized problem for developers, the three state and local experiences also surfaced difficulties associated with conditional approvals. The principal objection raised by developers with regard to conditional ISR approval has been the imposition of conditions which are outside the developer's control. Illustrations cited include major off-site roadway changes and certain transit improvements which would require commitments on the part of one or more public agencies, as well as a condition recently issued in Florida which requires a reduction in the number of parking spaces if CO standards are ever exceeded after a specific proposed facility is in operation. The consensus of developers who are experienced in trying to meet such conditions is that it is much better for the developer over the long run to be denied ISR approval than to be issued an approval conditional on events outside his control.

Developers have also focused on the use of excessive specificity in stating the conditions. Developers point out that if a permit is issued at an early date but no flexibility is allowed in the conditions, many of the advantages of an early review are lost. Subsurface conditions, utility placement, and other factors which may not be known until final engineering studies are completed just prior to construction may increase the costs of one type of roadway improvement to such an extent that another alternative might have a better financial feasibility. In such a case, the developer wants enough flexibility in the conditions to take advantage of the lower cost option. Likewise, relocation problems and land acquisition costs might tip the balance and favor one alternative over another. In general, developers seem to prefer an approach where the reviewer would list any and all design changes, together with the relative effectiveness of each in preventing CO standards from being exceeded. The developer, in turn, would be allowed to substitute alternatives to one or more of the design changes, provided the total effectiveness would not be altered.

Some developers have expressed a degree of skepticism over the effectiveness of transit-related conditions. The primary reason for this is uncertainty as to whether persons traveling to or from new developments would actually utilize transit. Other developers are of the opinion that it is both inequitable and inefficient to make specific indirect source facilities responsible for transit. These developers feel that transit must be dealt with comprehensively on an area-wide basis rather than in a piecemeal fashion.

Another issue raised by industry representatives is whether a reduction in the number of parking spaces at a facility might not only be counterproductive by increasing off-site traffic congestion, but also less effective in reducing CO concentrations than the use of good design measures for parking lots (some of these measures are described in Appendix F of this report).

Financial institutions are also very concerned about the form that these conditions might take. During the course of this study, Harbridge House posed several hypothetical cases to a number of major lenders. Each person interviewed was asked what his response would be if he requested to see an ISR permit as part of a loan application process and the permit contained one of the following conditions:

- An on-site road widening.
- An off-site road widening.
- The construction of a major interchange.
- The institution of transit service to a facility.

In brief, a summary of the responses showed that if the nature of the condition was such that government action was required (e.g., a new interchange, an off-site road widening, or a mass transit extension), financing would not be granted until the condition had been met or the improvement was almost in place. However, if the condition called for a design change that required time or money over which the developer had control (e.g., an on-site road widening or the establishment of a shuttle bus service), the financing would be granted before the service was in place.

Conditions to ISR approvals have been applied in each of the three state and local experiences. In Florida, conditions most often involve traffic and parking control strategies and support increased public transit opportunities. Some illustrations of conditional approvals are provided below.

According to DPC, conditions for approval of a sports stadium now under review will include the establishment of satellite parking facilities at various shopping centers with chartered buses to carry spectators to the sports events. This shuttling will require the shopping centers and the sports stadium to coordinate the timing of the games and shopping hours. DPC is also planning to include provisions for the continual monitoring of the sports stadium during the games, in order to alter traffic plans and/or sports schedules if the CO level approaches the point where it threatens to exceed standards. This case has not yet been resolved.

In another case, mass transit requirements will be placed on a proposed offshore power system manufacturing facility. It is projected that this operation will employ several thousand workers. DPC conditions will include provisions for an express bus service for 50 percent of the facility's employees. They will also require coordination between the local transportation authority and a mixed-use development in order to provide ample bus service for this particular complex.

A condition recently placed on a regional shopping center by DPC was a requirement that parking be restricted if NAAQS is ever exceeded. Implicit in this condition is the fact that some monitoring must be carried out after the center is in operation. The developer is concerned that this monitoring is a costly but unnecessary imposition, since the only time enforcement may ever be necessary is at the peak shopping period before Christmas. He has submitted the EPA-sponsored Geomet study on shopping centers in support of this conclusion.

The Florida DOT has been important in assessing the impact of new development on projected traffic flow. During the course of its efforts to ensure that level-of-service "C" during peak-hour traffic is maintained, DOT has, according to some developers, worked to ensure that necessary roadway design changes have been implemented. Sometimes the developer must contribute a portion of the costs of the road modifications; however, the cooperation of DOT in revising construction schedules and priorities in such a situation--although not required--is significant in helping developers meet ISR requirements while, at the same time, minimizing the air pollution impact associated with new or enlarged facilities. It should be noted that the involvement of the Florida DOT is not characteristic of most state DOT's.

In addition to private developments, conditional approvals have been issued for highway projects. Examples of conditions that have been applied to highways are as follows:

- If air quality standards are being violated following the completion of construction, feasible methods of control, such as control of traffic movement, will be investigated and a plan for control will be provided by DOT within eight months following completion of construction.
- If long-term projections for five to ten years do not show an improvement in air quality, and if projections of air quality do not show compliance by the end of the fifth year, DOT is required to submit a plan which will show that the violations can be corrected by the end of the fifth year. The plan is to be submitted no later than one year following completion of construction.

In Philadelphia conditions have been applied in two out of the three cases which had been approved as of 10 July 1974. Currently, AMS's approach to indirect source review includes consideration of approval to projects which may exceed CO standards but which have a net beneficial impact on all mobile source pollutants by reducing vehicle miles traveled. Similarly, it may disapprove a project that does not violate CO standards but would have a significant adverse impact on vehicle miles traveled, thereby increasing emission densities of nitrogen oxides and hydrocarbons.

The first project involves the establishment of a national historic park in downtown Philadelphia. A draft environmental impact statement (dated 5 October 1973) was submitted to AMS in mid-November of that year. The statement focuses on a proposed 550-space parking garage. Conditional approval to continue the planning for the project was given, provided that the final EIS be submitted to AMS for approval and that the following changes be made in the scope of the preliminary EIS:

- The preparation of a quantitative air quality impact analysis.
- A reduction in the number of parking spaces in order to discourage Philadelphia's city and suburban residents from traveling to the site by car.
- The establishment of a program to give priority parking privileges to visitors from outside the Delaware Valley through the use of discriminatory parking fees or a specific allocation of spaces between locals and outsiders.

There has been no response to the above comments from the responsible agency or its designee.

In the second case, first-phase review approval was given, conditional upon subsequent clarification and improvement of traffic data and air quality impact projections. This project involved a draft environmental impact for a downtown expressway. AMS is in favor of the expressway. It believes that the project will alleviate downtown congestion problems without having a significant adverse impact on vehicle miles traveled. AMS's comments on the draft EIS, however, were extremely critical of the air pollution methodology used; the supportive assumptions, which were presented without adequate justification; and the preparer's understanding of Federal air pollution standards. In essence, AMS would only approve the project subject to a redraft of the EIS. Because AMS's comments were just recently submitted, there has been no response from Penn DOT.

Since both projects are publicly funded, the economic impact associated with the implementation of the ISR conditions would not be as potentially damaging as would have been the case for a private development project. The reasons for this differential impact have already been discussed under timing issues related to the review process.

Conditions to ISR approvals in Oregon have primarily involved transit-related changes. The conditions cited in a letter of approval are typically as follows:

- The construction of a bus shelter on the site.
- The distribution of transit tickets to employees at a 20 percent discount (the developer must absorb the 20 percent differential because the transit agencies do not offer discount rates).
- The posting of transit schedules and route information in a prominent location.

Facilities without transit access are subject to such conditions as actively promoting carpooling by employees and bicycling. In such a case the developer has to provide DEQ with the relevant transit agency's prospective plans for servicing his facility.

DEQ often requires a reduction in the number of parking spaces at a given facility based on the type of use and the recognized level of parking necessary to support the represented square footage of that use. The rules-of-thumb parking ratios have been derived from various Federal agency sources and a DeLeuw Cather transportation study of the Portland area. DEQ generally allows one space per 400 square feet of leasable office area. (It also uses the standard of 0.59 spaces per employee.) A ratio of 5 spaces per 1,000 square feet of gross leasable retail area is also used. DEQ considers this figure high and feels that 3.5 to 4.5 spaces per 1,000 square feet is sufficient. The local zoning code serves as the standard for residential uses and for special cases. Complicated situations such as mixed-use developments are permitted enough spaces to meet their peak-demand estimates.

To date DEQ is aware of no projects that were stopped because of an inability to meet the necessary conditions to an ISR approval.

In revising the review procedures to conform to Federal ISR, DEQ has decided that rather than just conditioning a permit to take into account design measures for easing traffic flows and increasing transit usage, it will require an analysis incorporating the implementation of such measures prior to ISR approval. Specifically, the proposed regulations state that the director of the review agency must make a determination that a complex source will not result in traffic flow characteristics causing violation of the state air quality standards for CO. Such traffic flow characteristics are defined in the proposed regulations as follows:

- Minimizing vehicle running time within parking lots through the use of sound parking lot design.
- Ensuring adequate gate capacity by providing for the proper number and location of entrances and exits, and optimum signalization for such.

- Limiting traffic volume so as not to exceed the carrying capacity on roadways significantly affected by the complex source.
- Limiting the level of service at controlled intersections significantly affected by the complex source.
- Constructing and maintaining bus shelters and turn-out lanes.
- Making parking spaces available for park-and-ride stations.
- Posting transit route and scheduling information.
- Maintaining mass transit fare reimbursement programs.
- Constructing and maintaining exclusive transit ways.
- Constructing and maintaining bicycle and pedestrian pathways and bicycle racks.

Some people have expressed concern in public hearings on the manner in which the regulations will be interpreted and how many of the traffic flow characteristics should be applied to different projects. For example, should areas removed from transit have to post transit schedules and establish a fare reimbursement program? Others have questioned whether differential imposition of various types of characteristics might create inequities. Illustrative of this latter position is the issue of whether the requirement to dedicate a percentage of parking spaces for a park-and-ride program penalizes inner-city developments near transit stops.

Most of the problems associated with the use of conditions to an ISR approval are based on anticipated rather than actual difficulties. Developers appear very willing to comply with changes that are within their control and their budgetary limitations. Their main concern is that they not be forced to wait indefinitely for a highway or a transit agency to implement a specific plan which will impact their proposed development.

6. Permit

According to the Federal indirect source regulation, an applicant is to be notified in writing of his application approval, conditional approval, or denial, at the conclusion of the review process.[1] There is no specific permit issuance requirement. Permits, however, may be incorporated as part of a state's indirect source regulation. There are some advantages and disadvantages associated with a permit system which will be discussed below.

Florida's DPC issues a permit for all indirect sources (subject to their own review triggering points) prior to construction. A letter of approval or disapproval is issued by AMS at or before the conclusion of the 60-day review period. AMS is considering the adoption of a permit system to coincide with the effective date of Federal ISR. It feels, however, that permit issuance might be superfluous since the majority of projects submitted for review are funded by Federal and state agencies. Federal projects need not apply for permits issued at the local level; state agencies must apply but need not pay a permit fee. In Oregon DEQ issues a written approval, approval with conditions, or denial of a project to the developer or responsible agency. DEQ would favor using a permit system which it feels would have more force than the current approval/conditional approval/denial letters.

The argument in favor of permits coincides with DEQ's desire for more force. Developers, on the other hand, argue that permits might involve additional time delays if an agency other than the review authority must issue all permits. If Philadelphia, for example, were to shift to a permit system, the city's Bureau of Licenses and Inspection would have to issue the ISR permits.

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[1] 40 CFR 52.22(6)(8)(v).

7. Enforcement

Violators of the Federal indirect source regulations will be subject to the penalties outlined under section 113 of the Clean Air Act of 1970 as amended. These penalties incorporate fines of up to $25,000 per day or up to one year's imprisonment for the first violation.

To date the enforcement power of the three agencies represented in the state and local experience has not been exercised. Florida's DPC and Oregon's DEQ both claim that they lack sufficient staff to monitor each facility which has obtained an ISR approval. AMS in Philadelphia is reluctant to force ISR on certain facilities until it can rely on the support of the Federal government. As a result, projects that are politically controversial are not being approached for review at the present time.

Since DPC does not have sufficient manpower to carry out the enforcement function, it must depend on outside parties to alert it to possible violations. An example of this reliance is the case of a proposed expansion of a sports stadium, the Tangerine Bowl.

In this instance, the developer was brought to court by a private citizen who was concerned that the intent of the complex source regulations was being violated, although according to the letter of the law the facility did not require review. The seating capacity of the stadium was to be increased from 15,000 to 51,000, but no plans for additional parking were made. It was felt, therefore, that congestion would be substantially increased, since many spectators would be forced to drive around endlessly looking for available off-site parking spaces.

The ruling of the court was that a temporary expansion would be permitted, at the conclusion of which monitoring is to be performed during 10 major games to determine the impact of the stadium modification on CO concentrations.

At the conclusion of the monitoring period DPC is to assess the data and determine if an indirect source permit will be issued and if the expansion will be permitted to become permanent.

DPC does have broad legislative powers to enforce ISR and fine violators, but its limited staff and funding preclude maximum use of these. At this point DPC mostly reviews applications submitted to the regional offices rather than actively initiating ISR on potential development projects.

When DPC becomes aware of potential indirect sources of pollution, it requires that the facility undergo ISR. DPC is unable to initiate review of developments requiring ISR as often as it feels necessary. As a result DPC is considering relaxing ISR requirements to reduce the burden of applications per reviewer and to allow greater latitude for enforcement.

DPC also has difficulty enforcing ISR for facilities which come just under the guidelines requiring review. Theoretically DPC can exercise ISR authority for any project which is considered a potential indirect source of air pollution, but the problem of limited staffing once again inhibits this authority.

Oregon's DEQ would like to hire three additional full-time people for ISR. One person would work exclusively on review enforcement; the other two would work on reviews of smaller sized Portland projects and those submitted through the two regional air pollution control agencies for the Eugene and Salem areas. At present DEQ has no one to perform the enforcement function.

C. Conclusions

A number of potential problems in conjuction with the implementation of indirect source regulations have been identified from the experience of three areas which have already initiated the regulation of indirect sources. Conclusions concerning the problems and possible solutions associated with each phase of the development process are summarized below:

1. Data Acquisition and Analysis

Difficulties in data acquisition and analysis have been expressed by both developers and reviewers. Questions concerning assumptions and techniques to be used in monitoring, modeling, receptor siting, and traffic projections were most frequently raised. Traffic projections, in particular, seem to be creating problems in terms of reviewing highway projects, verifying data submitted by private developers, and analyzing design change effectiveness. To the extent that questions exist on data acquisition and analysis, delays can be created in processing applications.

The three areas studied--Florida, Oregon, and Philadelphia-- have or are in the process of preparing guidelines to help address some of the issues being raised on these topics. Assistance from the Federal EPA in preparing guidelines not only seems desired by reviewers, but could also be efficient in terms of eliminating a duplication of efforts at the regional and local levels and perhaps expediting the preparation and dissemination of essential guideline material.

2. Application Preparation and Submission

In terms of potential economic impact, the private development community is most vulnerable to the point at which ISR procedures are initiated. Although timing problems have been experienced on highway projects in the three study areas, efforts are being made to integrate an air quality review into the overall highway planning process.

Developers are anxious to remove uncertainties as early as possible in their development planning process. Otherwise, they risk the prospect of losing all of their initial investment in a project. The longer a developer is forced to wait, the larger his investment becomes as he commits himself to an architectural design and to future tenants.

Minimizing potential problems connected with when to initiate ISR will require efforts on the part of both developers and reviewers. The developer must adjust his planning process so that ISR is initiated at the most appropriate time. The adjustment should include reassessing the timing and nature of traffic studies required to complete the ISR application.

On the part of the reviewer, the three area cases show that for various reasons, early review as encouraged by the Federal EPA is not always perferred at the state and local level. Although concerns about allowing time for local involvement have some merit, it is also important to understand the impact that postponement may have on developers.

3. The Review Process

In order to minimize adverse economic impacts and reduce uncertainty, an expeditious review process can provide a significant benefit for developers.

In the state and local experience cases, however, there is evidence that reviewers are encountering problems processing ISR applications within 90 days or, in some cases, 120 days. The reason for this seems to be largely inadequate staffing. Additional manpower funding, accelerating training programs for existing staff, and even the creation of one or more positions of "roving reviewers" (provided at the Federal level and paid on a cost-share basis to move from office to office assisting in ISR processing during periods of peak applications) could all serve to eliminate problems related to the length of processing time.

4. Public Comment

Potential problems relating to the public comment period seem to be relatively minor compared to issues associated with other phases of ISR implementation. Those problems which were identified from the state and local experience cases are largely time-related and focus again, on the need to make the the process more expeditious.

5. Decision

Along with timing, conditions to permits seem to have caused the most difficulties in the study areas in terms of administering ISR. The major issues raised were with regard to the following:

- The timing of design changes that had public involvement.
- The determination of the effectiveness of alternative design changes.
- The use of operational conditions which call for review after a facility has been completed.

The issue of time problems related to public involvement in design changes can be resolved by issuing a permit in cases where developers will institute an interim bus system or similar alternative to service a facility until the permanent design change is completed.

The question of the effectiveness of design changes has no easy solution and is an area where contributions by Federal EPA in the form of technical analyses could provide significant benefit. This recommendation is made because for many developers, arriving at effectiveness levels can be difficult and costly--especially when dealing with topics with which historically they have had little experience (for example, transit, dial-a-ride, and carpooling). Moreover, the issue of whether capacity increasing design changes will induce additional non-site related traffic flows is a subject on which there is very little information for reliance by either developers or reviewers.

6. Permit Issuance and Enforcement

Very few problems were found from the state and local experience analyses which related to these phases of the ISR process. Two issues that were raised, however, related to whether to issue formalized permits or letters of approval and inadequate manpower for enforcement. In the first instance letters of approval generally involve less red-tape and therefore can be processed more quickly. In the second instance, resolution of manpower problems must be made in light of other EPA needs and priorities for areas expressing concern over the lack of additional staff.

APPENDIX A
STATE AND LOCAL EXPERIENCE DEVELOPMENT SURVEY FORMS

- Florida
- Philadelphia
- Oregon

FLORIDA PROJECT INFORMATION

Comprehensive as of 15 August 1974

NORTHEAST REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Highway	New	4 lane 7.3 miles	--	SR 202, Jacksonville	Rural	--	Approved	90 days	--
Highway Interchange	New	--	--	Jacksonville, Belfort Road	Residential/ Commercial	--	Approved	80 days	--
Highway	Modif.	2 to 4 lane	--	Jacksonville, Belfort Road	Rural	--	Approved	80 days	--
Shopping Center, Governor's Square (Rouse)	New	730,000 GLA	Parking for 5,000 cars	Leon County, Tallahassee	Urban	Road	Approved	83 days	--
Highway	Modif.	2 to 4 lane	--	SR 10, Tallahassee	Urban	--	Pending	Application received 4/19/74	--
Highway	Modif.	4 lane 1/2 mile	--	Jacksonville, Urban	Commercial	--	Approved	65 days	--
Parking Garage (Dept. of General Services)	New	135 m x 84 m	1,128 cars, 3 levels	Tallahassee, Urban	Commercial	--	Approved	70 days	--
Offshore Power Systems	New	1,031 acres	4 separate unenclosed parking lots for total of 2,402 cars	Jacksonville, Blount Island	Suburban	Roadway	Pending	Application received 5/31/74	Express bus service for 50% of employees
Shopping Center, Bay Meadows Mall (DeBartolo)	New	717,310 GLA	Parking lot for 4,784 cars	Jacksonville	Suburban/Urban	Roadway	Pending	Application received 7/2/74	--
Highway	New	4 lane	--	Jacksonville	Suburban	--	Pending	Application received 7/3/74	--

CENTRAL REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Highway SR 424A	Modif.	2 lane to 4 lane 2 miles 60' wide	--	Winter Park	Urban	--	Approved	60 days	--
Highway SR 434	Modif.	2 lane to 4 lane 2.4 miles	--	Longwood	Urban	--	Approved	100 days	--
Highway	Modif.	2 lane to 4 lane	--	Orlando	Urban	--	Pending	Application received 5/14/74	--
Sports Stadium, Tangerine Bowl (Civic Facilities Authority)	Expansion	15,000 seating increased to 51,000	No size increase planned	Orlando	Urban	Roads, Buses	Pending	Application received 1/74	--

NORTHWEST REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Highway Bridge	New	4 lane 1.3 miles	--	Across Apalachicola River, near Chattahoochee	Rural	--	Approved	84 days	--
Highway	New	4 lane 5.5 miles	--	SR 270 Gadsden City	Rural	--	Pending	Application received 6/28/74	--
Highway	New	4 lane 5.9 miles	--	SR 276 Jackson City	Rural	--	Approved	74 days	--
Highway	Modif.	2 lane to 4 lane	--	SR 87 Santa Rose County	Urban	--	Pending	Application received 4/12/74	--

SOUTHEAST REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Boyton Beach Shopping Center (DeBartolo)	New	1 million GLA 92 acres	5,800 acres	Boyton Beach	Rural	Highway	Approved	130 days	--
Lauderdale Lakes Shopping Center (DeBartolo)	New	--	--	Lauderdale Lakes	--	--	Rejected	162 days	--
Highway	Modif.	4 lane to 8 lane	--	Sunny Isles Causeway	Rural/Some commercial	--	Approved	130 days	--
Highway	Modif.	--	--	Urban Miami	--	--	Approved	63 days	--
Interama (World Trade Center, Univ., Amusement Park)	New	1,688 acres	6 parking lots for 13,000 vehicles	Ft. Lauderdale	Urban	--	Project temporarily discontinued	Application received 3/18/74	--
Highway	Modif.	4 lane to 6 lane divided	--	US 1	Urban	--	Approved	--	--
Highway	Modif.	6 lane 2.3 miles	--	Broward Cty. Urban	--	--	Approved	84 days	--
Highway	Modif.	Widening, 2 to 4 lane divided	--	SR 80	Rural	--	Approved	63 days	--
Highway	Modif.	2 to 4 lane	--	NW 7th Street Dade County	Urban	--	Approved	66 days	--
Highway	Modif.	4 lane to divided 6	--	SR 5 (US 1)	Urban	--	Approved	66 days	--
Bridge	Modif.	Widen 2 lane to 4 lane bridge	--	Holly Blvd. SR 820	Urban/Commercial	--	Approved	66 days	
Highway	Modif.	2 to 4 lane	--	SR 15 Belle Glade	Rural	--	Approved	67 days	--
Highway	Modif.	2 to 4 lane	--	SR 5 (US 1)	Rural	--	Approved	67 days	--

SOUTHEAST REGION DPC (Cont'd)

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Palm Beach Golf and Ocean Club (Pine Island Development Co.)	New	556 acres	Numerous small lots, avg. daily traffic 25,000 vehicles	Palm Beach	Rural	Roadway	Pending	--	--
Highway	Modif.	4 to 6 lane	--	US 1 Dixie Highway	Urban to rural	--	Approved	160 days	--

SOUTHWEST REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Highway	New	4 lane 3.4 miles	--	I-75 Collier-Lee County Line	Natural Vegetation	--	Pending	Application received 4/16/74	--
Highway	Modif.	2 lane to 4 lane	--	South Venice	Rural	--	Pending	Application received 5/8/74	--
Highway	Modif.	4 lane to 6 lane	--	SR 45 Collier County	Rural	--	Approved	120 days	--
Highway	New	4 lane 2.0 miles	--	SR 80 and 78 Ft. Myers	Residential/ Commercial	--	Pending	Application received 4/16/74	--
Highway	Modif.	2 lane to 4 lane	--	East Naples Collier County	Rural	--	Approved	115 days	--
Shopping Center, Clark Rd. Shopping Mall (DeBartolo)	New	943,000 GLA	5,725 vehicles, unenclosed	Sarasota	Industrial	Roadways	Rejected	232 days	--

WEST CENTRAL REGION DPC

Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Shopping Center Mall, Lakeland	New	933,000 ft.	34 acres; 5,318 vehicles; unenclosed	Suburban	Residential/Open space	Private	Approved	212 days	--
Shopping Center	New	347,256 sq. mi.	One-level parking for 4,539	Urban	Commercial	Roadway	Approved	84 days	If CO standards are exceeded, parking will be restricted[1]
Shopping Center East Lake Square (DeBartolo)	New	1,050,000 sq. ft.	62 acres; 5,250 vehicles; unenclosed	Urban	Residential/Open space	Private	Approved	122 days	Portions of parking lot closed if CO standards exceeded
Shopping Center, Rouse Center Rouse Community (Development Corp. of Florida)	New	800,000 sq. ft.	4,500 vehicles, unenclosed	Urban	Residential/Commercial/Open space	Private/Bus	Approved	194 days	Parking will be restricted when ambient air quality is exceeded
Shopping Center, Pinellas Park (DeBartolo)	New	709,000 sq. ft.	35.5 acres; 3,545 vehicles; unenclosed	Urban	Residential	Extensive bus and Private	Approved	143 days	--
Shopping Center Carriage Hill Mall (Amterre)	New	740,000 sq. ft.	29 acres; 3,700 vehicles; unenclosed	Urban	Residential/Open field	Private/Limited bus	Pending	Application submitted 6/28/74	If improvements not made, application will be reviewed again
Shopping Center, Crosswinds Mall (Amterre)	New	353,810 sq. ft.	276 acres; 2,706 vehicles; unenclosed	Urban	Residential/Commercial	Private/Bus	Returned for additional information[2]	Application submitted 9/24/73	--

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[1] Traffic projections questioned by Planning Board.

[2] Public hearing held.

PHILADELPHIA PROJECT INFORMATION

Comprehensive as of 10 July 1974

PHILADELPHIA REGULATION X PROJECTS AS OF 10 JULY 1974

Complete

Name and Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Independence National Historic Park--Recreational facility	New facility	Not available	550 spaces underground	Outside CBD	Not available	Transit and interstate highway	Response to draft EIS	Early Nov. 1973 - 23 Nov. 1973	1. Reduce parking allowance. 2. Implement disincentive system for local cars through discriminatory parking fees or specially designated spaces for locals.
Red Lion Road Improvement--Roadway	Widening to 4-lanes continuously	Not available	Not applicable	Northeast of city, outside CBD	Not available	Not applicable	Approval	28 June 1974 - Mid-July to end of July 1974	--
Vine Street Expressway--Expressway	New facility	Not available	Not applicable	Inner city	Not available	Not applicable	AMS recommended redraft of EIS	15 May 1974 - 9 July 1974	--

In Process

Name and Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Airport High-Speed Line--Transit	New line connecting downtown and airport	Not available	Not applicable	Connects CBD and airport	Not available	Not applicable	Preliminary draft EIS submitted and reviewed	Will start with final draft EIS submission	--
Airport Municipal Parking--Garages	New facilities	Not available	Two [illegible] 000-car structured garages	Outside CBD	Philadelphia International Airport	Highway	No formal application for second garage; first garage not subject to review	Not applicable	--

In Process (Cont'd)

Name and Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Betsy Ross Bridge--Bridge	New facility already constructed but not open	Not available	Not applicable	Outside CBD	Not available	Delaware Expressway and proposed Pulaski Highway	AMS contends bridge should have been reviewed; not yet resolved by city's Law Department	Not applicable	--
Bicentennial Transportation Program--Exclusive bus lanes, bikeways, etc.	New facilities and modifications	Not applicable	Not applicable	Greater metropolitan area	Not applicable	Not applicable	Ongoing participation	Not applicable	--
Commuter Rail Tunnel--Underground rail link for Penn Central and Reading R.R.'s	New facility	Not available	Not applicable	CBD	Not available	Not applicable	No submission yet	Not applicable	--
Delaware Expressway Cover--Highway	Modification	Not available	Not applicable	Inner city	Kensington and Society Hill neighborhoods	Not applicable	Project currently quashed because very controversial	Not applicable	--
Delaware Expressway Ramps--Highway	Additional ingress, egress ramps	Not available	Not applicable	Inner city	Kensington and Society Hill neighborhoods	Not applicable	Ramps undergoing redesign	Not applicable	--
Franklintown--Mixed-use (residential, office, motel)	New facility	Not available	Not available	Inner city	Not available	Not available	Project delayed because of financing problems	Not applicable	--
Head House Square--Mixed-use (commercial, residential)	Modification to parking	Not available	Not available	Inner city	Residential neighborhood	Not available	Design of modification not yet finalized	Not applicable	--
Market Street East--Mixed-use (retail, office)	New facility	8 city blocks	4-6 parking garages; spaces undetermined	CBD	Mostly commercial, some residential	Transit (bus, rapid rail), rail, and proposed highway	EIS undergoing preparation	Not applicable	--

In Process (Cont'd)

Name and Type of Facility	Nature of Development	Size	Size and Nature of Parking Lot	Location	Adjacent Land Use	Transportation Accessibility	Application Status	Length of Review	Conditions on Permit
Penn's Landing--Mixed-use	New facility	Not available	Not available	Not available	Not available	Delaware Expressway	Project depends on expressway completion	Not applicable	--
Pulaski Highway--Highway	New facility	Not available	Not applicable	CBD	Planned to cut right through inner city	Not applicable	Project recently revived after much controversy; EIS undergoing preparation	Not applicable	--
SEPTA Transit Improvements--All transit program changes subject to Regulation X	New facilities and modifications	Not available	Not applicable	Greater metropolitan area	Not available	Not applicable	Ongoing interaction	Not applicable	--

OREGON PROJECT INFORMATION

Sample of Parking Facility
Cases Reviewed in Oregon
Prior to July 1974

DEVELOPMENT: Colonial Office Park (Donald E. Pollack Investments)

Type of Facility	Office park complex
Nature of Development	New facility
Size	2 buildings: one 28,680 sq. ft., other 9,100 sq. ft.; total of 37,780 sq. ft.
Size and Nature of Parking Lot	71 spaces
Location	--
Adjacent Land Use	Adjacent to existing office building of 15,000 sq. ft.
Transportation Accessibility	--
Transit Availability	Existing bus, one line at site, three lines near site
Management of Parking Supply	--
Application Status	Conditioned permit
Length of Review	Application submitted 2/21/74; Permit with conditions 3/22/74

CONDITIONS ON PERMIT

Provide bus schedules and route information for employees and tenants.

Construct a bus shelter at the site subject to Tri-Met standards.

Provide a 20% discount on mass transit fares to employees.

DEVELOPMENT: Columbia Independent Refinery, Inc.

Type of Facility	Fuel purification facility
Nature of Development	New parking facility
Size	6,500 - 10,000 sq. ft. refinery; 100,000 bbl/day; 200 employees on three shifts
Size and Nature of Parking Lot	80 spaces
Location	Outside downtown suburban Portland
Adjacent Land Use	Part of Rivergate Industrial Park, Portland
Transportation Accessibility	--
Transit Availability	Bus route one mile from site; no transit changes planned
Management of Parking Supply	--
Application Status	Approval pending
Length of Review	Application 4/3/74; Conditional approval 5/2/74

CONDITIONS ON PERMIT

Develop mass transit incentive program.

DEVELOPMENT: Freight Lines Corporation (Headquarters)

Type of Facility	Office building
Nature of Development	New construction
Size	92,000 sq. ft. GLA; 500 employees
Size and Nature of Parking Lot	370 spaces reduced to 300
Location	Within city limits but outside CBD
Adjacent Land Use	--
Transportation Accessibility	--
Transit Availability	Expansion of existing Tri-Met bus service. More frequent service and new stop closer to proposed site.
Management of Parking Supply	No
Application Status	Approved with conditions
Length of Review	Initial submission 4/1/74; Revision in parking 4/19/74; Conditioned permit 5/13/74

CONDITIONS ON PERMIT

Continue to promote use of express and regulatory scheduled buses, shuttles, and car pools, through currently established programs as described in information submitted.

Implement mass transit and car pool incentives:

- Approximately one week prior to time of establishment of regular scheduled Tri-Met service from city center or of Kilingsworth line change, notify and encourage potential riders through mail advertisements, promotional displays, and personal contact.

DEVELOPMENT: Freight Lines Corporation (Headquarters) (Cont'd)

CONDITIONS ON PERMIT (Cont'd)

- Two weeks before occupying new development, give corporate personnel information regarding Swan Island Express buses. One week before, Transport Coordinator will personally contact potential riders to sell tickets. Information and tickets will be disseminated to industries in the area. Car pools for three people or more will be provided preferred parking spaces.

Continue efforts to encourage carpooling.

Circulate new shuttle service schedule.

DEVELOPMENT: General Electric Service Headquarters Building

Type of Facility	Office building, three units in complex
Nature of Development	New building construction
Size	One unit - 19 stories; one unit - 4 stories; one unit - 6 stories. 510,000 sq. ft. GLA distributed as 300,000; 170,000; and 40,000.
Size and Nature of Parking Lot	625 spaces underground, two levels, reduced to 401 parking spaces on two underground levels
Location	Inner city
Adjacent Land Use	Downtown waterfront, a public space for recreation; also, office and commercial activity
Transportation Accessibility	Modal split: auto - 60%; bus - 34%; pedestrian - 6%
Transit Availability	Bus service (more frequent service proposed)
Management of Parking Supply	Yes
Application Status	Approved developer initial contact 9/26/72; Original application 2/9/73; EIS also submitted application 2/9/73
Length of Review	Local response and request for more information 3/9/73

CONDITIONS ON PERMIT

Amendment by developer 9/10/73; plans requested not sent until 4/5/74, final approval 4/24/74.

Proposed office parking facilities reduced to 401; parking garage main entrance shifted to Taylor Street between First Avenue and Front Avenue.

Thirty to 40 spaces for company cars will access and egress on Salmon Street between Front and First Avenues.

DEVELOPMENT: Holly Farm Shopping Center

Type of Facility	Shopping center
Nature of Development	New facility
Size	135,000 sq. ft. GLA - retail; 5,000 sq. ft. GLA - restaurant; total of 140,000 sq. ft.
Size and Nature of Parking Lot	501 spaces
Location	Suburban (Clackamas County, southeast of downtown Portland)
Adjacent Land Use	--
Transportation Accessibility	--
Transit Availability	Tri-Met bus service
Management of Parking Supply	No
Application Status	Approval with conditions
Length of Review	Original application 3/22/74; DEQ response 4/22/74; Approval 6/6/74

CONDITIONS ON PERMIT

Currently effective.

Post Tri-Met schedules for patrons and employees.

Construct covered bus shelter adjacent to McLoughlin Boulevard to meet or exceed Tri-Met specifications.

Make Tri-Met tickets available at 10% discount to patrons and employees desiring to use bus service.

DEVELOPMENT: John's Landing

Type of Facility	Mixed use (commercial and residential)
Nature of Development	New facility
Size	70 acres, 600,000 sq. ft. commercial, recreation, and 800 living units
Size and Nature of Parking Lot	2,464 spaces
Location	1.7 miles south of downtown Portland
Adjacent Land Use	Industry, commercial, and limited residential
Transportation Accessibility	4-lane road at site, 10 ft. per lane
Transit Availability	Limited Tri-Met bus service
Management of Parking Supply	No
Application Status	272 spaces approved by EQC 3/12/74
Length of Review	Application submitted 12/18/74; Conditional aproval 3/12/74 of 272 spaces

CONDITIONS ON PERMIT

Write into the Homeowners Association agreements and Office management agreements a means of providing a 20% reduction in transit fares for residents and tenants in the project.

Construct bus shelters.

Provide Tri-Met scheduling and route information.

Improve Macadam Avenue to 4-lane boulevard, 12 ft. lanes, left-turn refuges. Include measures to reduce noise.

Improve rail transit system and bus transportation.

DEVELOPMENT: John's Landing, Phase I (Water Tower)

Type of Facility	Retail/office building renovation
Nature of Development	Redevelopment project
Size	39,000 sq. ft. GLA - office; 56,000 sq. ft. GLA - retail
Size and Nature of Parking Lot	235 spaces distributed as 1/3 structured, 2/3 surface. Phase II - 80 spaces. Approval for 278 spaces total.
Location	Downtown, outside CBD
Adjacent Land Use	--
Transportation Accessibility	--
Transit Availability	Limited Tri-Met bus service
Management of Parking Supply	No
Application Status	Approval for 235 spaces granted 7/21/73 (no letter in file); expanded to 278 spaces 9/8/73
Length of Review	Original application submitted 3/16/73; Modification (80 spaces) 7/5/73

CONDITIONS ON PERMIT

Apply usual three transit incentives to all 278 spaces.

DEVELOPMENT: Kaiser-Aetna Retail-Commercial Division

Type of Facility	Shopping center
Nature of Development	New facility
Size	95,683 sq. ft. GLA (neighborhood scale w/supermarket)
Size and Nature of Parking Lot	500 spaces reduced to 476
Location	Suburban, near Salem
Adjacent Land Use	--
Transportation Accessibility	Located at intersection; two gates
Transit Availability	Bus service
Management of Parking Supply	No
Application Status	Approved with conditions by DEQ 5/22/74
Length of Review	Original application 2/12/74; Local approval 4/18/74

CONDITIONS ON PERMIT

Construction approved for only 476 spaces. Construction also approved of convenience shelter for transit patrons.

Implement program to encourage public transit ridership.

Provide up-to-date information on bus schedules and routing to potential riders.

Provide bicycle parking facilities.

DEVELOPMENT: McGinty, John, Real Estate Shopping Center (5th and Q Streets)

Type of Facility	Shopping Center
Nature of Development	New facility
Size	Not available
Size and Nature of Parking Lot	275 spaces
Location	Suburban (Springfield, outside Eugene)
Adjacent Land Use	Not available
Transportation Accessibility	Near I105
Transit Availability	Not available
Management of Parking Supply	No
Application Status	Permit granted
Length of Review	Application submitted to DEQ 7/24/73; DEQ approval 7/24/73; Lane Regional Air Pollution recommendation to DEQ 7/11/73; Submission 7/6/73

CONDITIONS ON PERMIT

None

DEVELOPMENT: Meyer, Fred, Shopping Center

Type of Facility	Shopping center
Nature of Development	Modification
Size	131,519 sq. ft. GLA with expansion
Size and Nature of Parking Lot	209-space expansion; 275 spaces existing; modification would bring total to 484 spaces
Location	Suburban
Adjacent Land Use	Residential
Transportation Accessibility	Bordered on all sides by road grid, some with four lanes, others with two, all two-way streets
Transit Availability	Served by bus line
Management of Parking Supply	No
Application Status	Partially approved, remainder pending zoning change
Length of Review	Application submitted 3/7/74; Approval with conditions 4/8/74

CONDITIONS ON PERMIT

Distribute bus information to employees and patrons of shopping center. Construct bus shelter under Tri-Met standards. Provide employees with 20% discount (only those who work at Lombard Store) who use Tri-Met. Provide site plans showing adjacent road grid and surrounding land uses.

DEVELOPMENT: Mill Park Baptist Church

Type of Facility	Existing church with new sanctuary
Nature of Development	New sanctuary additional parking
Size	Expansion of parking facility from 48 spaces to 91 (increment of 43)
Size and Nature of Parking Lot	Not applicable
Location	Presumably not downtown
Adjacent Land Use	--
Transportation Accessibility	--
Transit Availability	Tri-Met bus service
Management of Parking Supply	No
Application Status	Conditional approval
Length of Review	Application submitted 4/15/74; Follow-up letter 4/23/74; Approval letter 5/22/74

CONDITIONS ON PERMIT

Make available current bus schedules and route information during the week. Use facility as park and ride station.

DEVELOPMENT: Moore Dry Kiln Company

Type of Facility	Industrial corporation
Nature of Development	Modification to existing facility
Size	92,000 sq. ft. manufacturing; 160 to 170 employees
Size and Nature of Parking Lot	117 spaces total (81 existing and 36 additional)
Location	Suburban Portland
Adjacent Land Use	Manufacturing Plant (Crown Zellebach) across the street
Transportation Accessibility	100% auto; bad congestion at intersection near the site, although no major highway
Transit Availability	None available and no proposed plans to provide access
Management of Parking Supply	No
Application Status	Approved
Length of Review	Application submitted 9/5/73; Approval 10/26/73

CONDITIONS ON PERMIT

DEQ wanted deductions to 89 spaces but backed off.

DEVELOPMENT: Mountain Park Corporation Towne Center

Type of Facility	Mixed-use: residential, commercial, office, motel, restaurant
Nature of Development	New facility
Size	538,000 sq. ft. feasible area, including 450 apartments
Size and Nature of Parking Lot	2,819 spaces (3,303 originally); multilevel structures
Location	Suburban (Lake Oswego, outside Portland)
Adjacent Land Use	New community for 12,500 planned adjacent to site
Transportation Accessibility	Kew Parkway - need to widen to 4-lane arterial by 1980 (when whole project completed)
Transit Availability	Existing Tri-Met bus service; want direct shuttle service by Tri-Met to and from site
Management of Parking Supply	No
Application Status	Conditioned permit
Length of Review	Application submitted 12/26/73; Conditioned permit 6/11/74

CONDITIONS ON PERMIT

Construct at least two bus shelters to meet or exceed Tri-Met specifications. Employers provide Tri-Met tokens or script at the Towne Center at not more than 8% of cost of token or script. Post Tri-Met schedule information.

Present two copies of final plans for progressive construction to Department when agreement reached with Tri-Met for additional transit adequate to justify park and ride station.

Construct up to 300 additional parking spaces for such a facility. Spaces designated parking between 7:00 A.M. and 6:00 P.M.

DEVELOPMENT: Portland Adventist Hospital

Type of Facility	New hospital facility (actually a relocation)
Nature of Development	--
Size	204-bed general hospital, medical-professional offices, school for nursing, apartments for students. 32 acres to be developed, 8 acres open space. Total of 40 acres.
Size and Nature of Parking Lot	685 spaces; 1980 expansion total of 800 spaces
Location	Suburban (5 miles east of Portland CBD)
Adjacent Land Use	Residential (single-family); School community scale shopping center
Transportation Accessibility	Near proposed I 205
Transit Availability	Tri-Met bus service exists. Proposed express bus service also near site.
Management of Parking Supply	No
Application Status	Approved with conditions
Length of Review	Original application 2/21/73; EIS required by CWAPA 3/23/73; Conditional approval 9/24/73

CONDITIONS ON PERMIT

Conscientiously implement program to reimburse 50% of the direct expense for public transportation to employees who use public transportation, excluding taxicabs.

Construct a bus shelter to meet or exceed Tri-Met specifications at the bus layover point for the Mt. Tabor line on the project site. Complete construction to coincide with the opening of the hospital.

DEVELOPMENT: Portland Community College (Rock Creek Center)

Type of Facility	New building for educational purposes
Nature of Development	New facility
Size	155,000 sq. ft.
Size and Nature of Parking Lot	449 spaces
Location	Suburban low-density and rural residential; major agricultural land use
Adjacent Land Use	--
Transportation Accessibility	--
Transit Availability	Bus service 1 mile from site. Expansion planned directly to site.
Management of Parking Supply	No
Application Status	Disapproved by EQC 5/24/74; not in accordance with provisions of ORS 468. 275 to 468.305, 468.340, and 468.410 and applicable rules. Standards and regulations construction would require extension of sewer and water service into unserved areas--necessitate improvement of roads and transit service extension. Would encourage development of other commercial and residential projects in the area.
Length of Review	Submitted to DEQ 3/15/74; CRAG 8/30/73

CONDITIONS ON PERMIT

No permit or letter of approval authorized (see Application Status).

DEVELOPMENT: Valley River Center

Type of Facility	Mixed-use, although mostly retail, small office representation
Nature of Development	Facility modification
Size	Regional scale, 4 department stores 859,283 sq. ft. GLA (805,175 retail, 54,108 office)
Size and Nature of Parking Lot	872 additional spaces for two new department stores and some smaller retail spaces (3,619 existing spaces)
Location	Eugene
Adjacent Land Use	--
Transportation Accessibility	Access to Delta Freeway, 4-lane divided (2 lanes each way)
Transit Availability	Bus service Lane District Transit (4 lines)
Management of Parking Supply	No
Application Status	Letter of approval 9/23/73
Length of Review	Application submitted to Lane Regional Air Pollution Authority 4/30/73; EIS submitted 5/15/73

CONDITIONS ON PERMIT

EIS supplemented 9/22/73 development and implementation of transit ridership incentive program.

Construct no more than 677 parking spaces in ratio of 5 spaces for every 40 persons using public transit to work or shop at the center.

DEVELOPMENT: Washington Square

Type of Facility	Shopping center, enclosed mall
Nature of Development	New facility
Size	Regional scale 1.1 million sq. ft. GLA; 107 acres; 6 major department stores
Size and Nature of Parking Lot	1,997 spaces approved by DEQ for two department stores, 363,612 sq. ft. GLA. Original application for 5,219 spaces. Revised application for 1,997, followed up by additional application for 3,364 spaces
Location	--
Adjacent Land Use	Public golf course; small commercial center; apartments and other residences
Transportation Accessibility	Borders Beaverton-Tigard Expressway
Transit Availability	Put in own bus system feeder line (park and ride). Pressure on Tri-Met to expand its service
Management of Parking Supply	No
Application Status	Original application submitted 11/17/72; Revised submission 6/21/73; Approval of 1,997 spaces 7/15/73; Second major application 7/15/73
Length of Review	Approval by EQC 9/21/73 for 3,032 additional spaces (5,219 - 1,997)

CONDITIONS ON PERMIT

Construct 1,997 spaces.

Portions of proposed area identified in plans. Specifications not specifically identified for parking are to be prohibited from use by any vehicle other than construction vehicles.

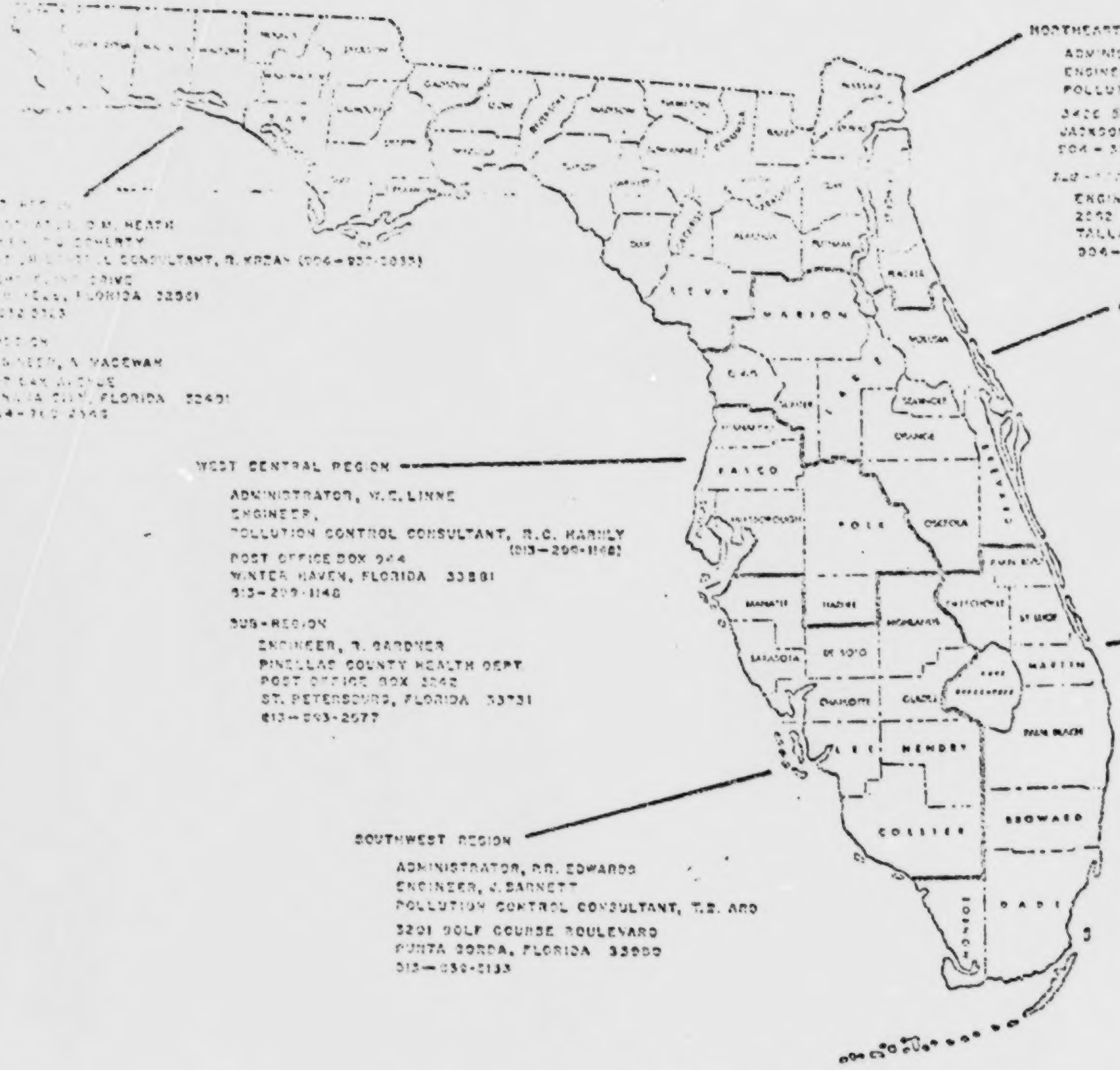
The number of spaces available for parking are to be reduced in direct proportion to increasing transit patronage to the Washington Square Shopping Center. No more than 3,032 spaces can be built on the site. (This is in answer to the application for 3,369 spaces.)

APPENDIX B
FLORIDA GUIDELINES

3-1-A

FLORIDA DEPT. OF POLLUTION CONTROL REGIONAL OFFICES

REGIONAL OFFICES


LEVY
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SARASOTA
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GLADES
LEE
HENDRY
COLLIER
BROWARD
DADE
MONROE
PALM BEACH
MARTIN
ST. LUCIE
ORANGE
SEMINOLE
VOLUSIA
ALACHUA
PUTNAM
DIXIE
CITRUS
GADSDEN

NORTHWEST REGION
ADMINISTRATOR, D.M. HEATH
ENGINEER, T. DOHERTY
POLLUTION CONTROL CONSULTANT, R. KRZAN (904-837-0033)
[illegible] DRIVE
GULF BREEZE, FLORIDA 32561
904-932-5363

SUB-REGION
ENGINEER, A. MACEWAN
427 BAY AVENUE
PANAMA CITY, FLORIDA 32401
904-763-2543

NORTHEAST REGION
ADMINISTRATOR, W.R. OPP
ENGINEER, F. WATKINS
POLLUTION CONTROL CONSULTANT, R.D. DILLARD, SR.
3426 BILLS ROAD
JACKSONVILLE, FLORIDA 32207
904-396-6959

SUB-REGION
ENGINEER, GATES FOUNTAIN
2562 EXECUTIVE CENTER CIRCLE EAST
TALLAHASSEE, FLORIDA 32301
904-488-3529

CENTRAL REGION
ADMINISTRATOR,
ENGINEER, W. WOOD
POLLUTION CONTROL CONSULTANT, H.L. MILLER
3319 MAGUIRE AVENUE
SUITE 232
ORLANDO, FLORIDA 32801
305-647-6450

SEMINOLE COUNTY SECTION
ENGINEER, L. ADAIR
SEMINOLE COUNTY COURTHOUSE
SANFORD, FLORIDA
305-647-6450

WEST CENTRAL REGION
ADMINISTRATOR, W.C. LINNE
ENGINEER,
POLLUTION CONTROL CONSULTANT, R.C. HARILY
(813-299-1148)
POST OFFICE BOX 944
WINTER HAVEN, FLORIDA 33881
813-299-1148

SUB-REGION
ENGINEER, R. GARDNER
PINELLAS COUNTY HEALTH DEPT
POST OFFICE BOX 3242
ST. PETERSBURG, FLORIDA 33731
813-893-2577

SOUTHEAST REGION
ADMINISTRATOR,
ENGINEER, W STRAHM
POLLUTION CONTROL CONSULTANT, R.L. TASH
COURTHOUSE SQUARE BUILDING
200 SOUTHEAST 6TH. STREET
SUITE 504
FORT LAUDERDALE, FLORIDA 33301
305-524-6593

SUB-REGIONS
ENGINEER, A. COX
806 SOUTH SIXTH STREET
FORT PIERCE, FLORIDA 33450
305-464-8525

ENGINEER, B. BOE
11399 OVERSEAS HIGHWAY
MARATHON SHORES, FLORIDA 33052
305-743-5008

SOUTHWEST REGION
ADMINISTRATOR, R.R. EDWARDS
ENGINEER, J. BARNETT
POLLUTION CONTROL CONSULTANT, T.E. ARD
3201 GOLF COURSE BOULEVARD
PUNTA GORDA, FLORIDA 33950
813-639-2133

PREPARED BY DIVISION OF PLANNING
FLORIDA DEPARTMENT OF POLLUTION CONTROL
2562 EXECUTIVE CENTER CIRCLE EAST
MONTGOMERY BUILDING
TALLAHASSEE FLORIDA 32301
904-488-1236

NOT REPRODUCIBLE

20-AUG-73
953/73,100/20,00,1

LOCAL AIR POLLUTION CONTROL AGENCIES AUTHORIZED BY THE FLORIDA DEPARTMENT OF POLLUTION CONTROL

ALACHUA COUNTY POLLUTION CONTROL
Alachua County Courthouse
Gainesville, 32601

MANATEE COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL CONTROL SECTION
202 6th Avenue East
Bradenton 33505

BROWARD COUNTY POLLUTION CONTROL BOARD
500 SW 14th Court
Ft. Lauderdale

DADE COUNTY POLLUTION CONTROL
864 NW 23rd Street
Miami 32217

HILLSBOROUGH ENVIRONMENTAL
PROTECTION COMMISSION
906 Jackson Street
Tampa, 33602

JACKSONVILLE DIVISION OF BIO-ENVIRONMENTAL SERVICES
515 West 6th Street
Jacksonville, 32202

PALM BEACH COUNTY POLLUTION CONTROL
1500 West 8th Street
Riviera Beach, 32301

SARASOTA COUNTY DEPARTMENT OF ENVIRONMENTAL CONTROL
1301 Cattlemen Road
Sarasota, 33577

GENERAL INSTRUCTIONS AND APPLICATION FORMS FOR INDIRECT SOURCE REVIEW STATE OF FLORIDA

General Instructions

1) Project Description. This portion of the application should include general information on the type of business(es) to be conducted at the site and other information regarding the anticipated level of activity such as seating capacity, leasable business area, future expansion plans etc.

For DOT projects, general information on project's length, number of lanes, location, and construction schedule is required.

2) Meteorological Data. (For projects other than roadways). DPC will accept the following worst conditions:

(a) Stability Class D (b) Wind Speed 0.1 m/sec (2mph) and (c) Wind Direction should be selected to result in maximum carbon monoxide levels. Other assumed worst conditions will be accepted if adequately justified.

For DOT projects these worst conditions will be accepted:

(a) Stability Class D, (b) Wind Speed 0.9 m/sec (2 mph), and (c) Wind Direction 22.5 with respect to highway. The wind direction as indicated allows for four (4) specific directions. The assumed direction should be selected so that maximum carbon monoxide concentrations are obtained. Other assumed worst conditions will be accepted if adequately justified.

3) Ambient Air Quality. Current maximum carbon monoxide ambient air concentrations in the immediate vicinity of the proposed source are required. If data is not available from regional or local pollution control agencies, the applicant is required to conduct on-site testing utilizing approved DPC methods and procedures. Location of sampling sites should coincide with model receptor locations. Information concerning ambient air testing can be obtained from any DPC regional office.

For projects other than roadways, projections of CO concentrations will be based upon local development potential.

4) **Physical Data.** Enter the required information for the proposed highway or facility and for the nearest adjacent roads, if applicable.

5) Receptor Distances. Enter the required information and show the receptor numbers on the project location map. The receptors should be located so that maximum carbon monoxide levels will be detected. These locations should coincide with the location of sensitive receptors as much as possible. The number of receptors shall be sufficient to characterize the carbon monoxide levels in the immediate impact area.

(6) Traffic (For DOT projects) Enter the required information for each of the years indicated. This information will usually be transcribed from the standardized computer programs used by D.O.T.

Traffic Data (For projects other than roadways) Future projections for existing complex sources [illegible] should reflect the increase in traffic that has or will occur from the date of ambient air testing. The current and future contributions from existing traffic will be reflected in the Ambient Air Quality Data. Current and future traffic projections for most highways may be obtained from the Florida Department of Transportation.

7) **Stationery Sources.** (For projects other than roadways) Enter the required information on all incinerators, large heating units, process vents, and so forth.

(For projects other than roadways)

8) Results Section. It has been shown that the year of maximum ambient air pollutant concentrations resulting from a complex source does not necessarily have to be the first or last (10th) year of review, but may occur sometime in between. This "critical" year is a function of traffic increase and level of automotive emission controls found in any year. Accordingly, the applicant is required to determine the "critical" year and provide model results for that year as well as the first and tenth year. This determination can be made based on the results of the calculations found in the Appendixes I, II, or III.

(For DOT projects)
Results. Enter the required information for each of the years indicated. This information will usually be transcribed from the standardized computer programs used by D.O.T.

The sources and methods used to determine the projections found in the Ambient Air Quality Data and Traffic Data Sections must be included with the application.

9) Statements by Applicant. This paragraph is provided for the applicant to add to the permanent record any information he believes should be considered in evaluating the application.

12/15/73

STATE OF FLORIDA
DEPARTMENT OF POLLUTION CONTROL

APPLICATION TO MODIFY/CONSTRUCT COMPLEX AIR POLLUTION SOURCE (HIGHWAYS)

SECTION I - GENERAL INFORMATION

Source Type: HIGHWAY
Project Type: New ______ Modification ______

Source Name: ______ County: ______
Source Location: City ______
UTM: East ______ North ______

Applicant Name and Title: ______
Address: Street ______ City ______ State ______ Zip ______
Telephone Number: ______

Consultant Name: ______
Address: Street ______ City ______ State ______ Zip ______
Telephone Number: ______

Estimated Starting Date of Construction ______
Estimated Completion Date of Construction ______

Application Filing Date ______

SECTION II - TECHNICAL DATA

1. Brief Description of Proposed Project's Nature and Extent: ______

2. Meteorological Data:

Parameter	Worst Conditions
a. Stability Class	
b. Wind Direction (degrees)	
c. Wind Speed (m/sec)	

Source and Date of Data: ______

All applications will require certification by a professional engineer, registered in the State of Florida, or qualified in accordance with chapter 17-4 of the Departments rules.

3. Ambient Air Quality Data: Carbon Monoxide

Time	Year	Concentration (mg/m^3) 1 Hour	 8 Hour
a. Current			
b. 1st Year			
c. Critical Year			
d. 10th Year			

Note: Future ambient air projections are made assuming the proposed highway were not constructed.

Source of Data:____

4. Physical Data:

Parameter	Proposed Highway	Adjacent Roads Road No____	 Road No____	 Road No____
a. Width (ft.)				
b. Elevation with respect to adjacent terrain (ft.)				
c. Posted Speed Limit (mph)				
d. Wind angle with respect to road (degrees				

5. Receptor Distances:

a. Normal distance from road to receptor (ft)	RECEPTOR NUMBER 1	 2	 3	 4	 5	 6	 7	 8
1. Proposed Highway								
2. Road No.								
3. Road No.								
4. Road No.								

Source of Data: ____

7. Results

A. Carbon Monoxide One Hour Concentrations (mg/m^3)

	Receptor Number							
	1	2	3	4	5	6	7	8
a. Proposed Highway								
1. 1st Year								
2. Critical Year								
3. 10th Year								
b. Road No._____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
c. Road No._____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
d. Road No._____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
e. Ambient Air								
1. 1st Year								
2. Critical Year								
3. 10th Year								
f. Total Concentration								
1. 1st Year								
2. Critical Year								
3. 10th Year								
g. Percent of Standard								
1. 1st Year								
2. Critical Year								
3. 10th Year								

B. Carbon Monoxide Eight Hour Concentrations (mg/m^3)

	Receptor Number							
	1	2	3	4	5	6	7	8
a. Proposed Highway								
1. 1st Year								
2. Critical Year								
3. 10th Year								
b. Road No. ____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
c. Road No. ____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
d. Road No. ____								
1. 1st Year								
2. Critical Year								
3. 10th Year								
e. Ambient Air								
1. 1st Year								
2. Critical Year								
3. 10th Year								
f. Total Concentration								
1. 1st Year								
2. Critical Year								
3. 10th Year								
g. Percent of Standard								
1. 1st Year								
2. Critical Year								
3. 10th Year								

8. Brief Discussion of Results: ____________________

9. Statements by Applicant:

OUTLINE OF AIR QUALITY ASSESSMENT

1. Project location map
    - A. County Map with project highlighted
    - B. Interchanges should be shown

11. Introduction
    - A. Brief description of project
        - 1. Type and size (i.e. Interstate 6-lane, 15.2 miles)
        - 2. Location of interchanges
        - 3. Limits of proposal (i.e. from_____ to_____)
    - B. Brief description of land use around the project corridor
        - 1. Existing
        - 2. Projected for 10 years

111. Description of method used for projections.
    - A. Type model used
    - B. Description of projections
        - 1. On proposed project
            - a. Years projected
            - b. Location of projections
        - 2. On existing facilities in close proximity, accomodating a significant amount of vehicular traffic.
            - a. Years projected.
            - b. Location of projections
    - C. Identify traffic and meteorological parameters used (i.e. peak traffic, etc.)

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IV. Results of projections

A. Brief written summary of results

B. Results graphically depicted

1. Label one-hour or 8-hour projection

2. Label met conditions

C. Ambient data to be included if available

V . Construction Specifications

A. Section 102(dust control), 17-2 FAC

B. Chapter 17-5 FAC (open burning)

VI . Appendix

A. Copy of coding sheets

1. All coding sheets used to arrive at the concentrations graphed should be included.

B. Map of Project

1. Indicate point where projections were made.

2. Show traffic projections along with truck mix design hour % and directional factor.

C. All other supporting material.

APPENDIX C
OREGON
REGULATIONS AND GUIDELINES

C-1-A

Department of Environmental Quality
1234 S. W. Morrison
Portland, Oregon 97205

Guidelines for Review of Proposed New Highway Construction in Urban Areas

A. Purpose

To provide basic guidelines to the Oregon State Highway Division for the preparation of environmental impact statements to be submitted as required under OAR, Chapter 340, Sections 20-050 through 20-070, for planned new highway construction in urban areas.

These guidelines are intended to supplement the guidelines prepared by the Federal Highway Administration and set forth in Policy and Procedure Memorandum 90-1. Where overlapping of requirements occurs, the more restrictive interpretation is to be followed.

From time to time, as the DEQ determines the need, revisions to these guidelines will be published.

B. Stages of Review

Stage I — Review proposal to build a new highway from point A to point B within specific corridor alternatives.

Stage II — Review design alternatives for highway construction.

The appropriate regional air pollution authority will review the proposals and make recommendations to DEQ at each stage of review. EQC approval will be required before a final corridor and/or design is chosen.

C. Requirements for and Contents of Environmental Impact Statements

An environmental impact statement, as a minimum, will be required for Stages I and II of the review process.

The following sections outline subject matter and content of submission which shall, as a minimum, be covered in environmental statements submitted during Stages I and II of the review process.

4/24/72

(1) Contents of Stage I Environmental Statements

a. A description of the proposed highway improvement and its surroundings.

The description should include the following type of information for each alternative corridor:

1. Type of facility proposed; length, width and location map of corridor; right of way width desired including existing right of way in corridor.

2. Major design features that can be identified such as number of lanes, probable access control, approximate location of bridges and interchanges, etc. in the corridor.

3. Basic traffic data estimates including trips for the probable design year and anticipated new trips generated two years after completion of the highway section and through 1990. This information should be included for the corridor, the immediate vicinity, the urban central business district and the total urban area within or within 5 miles of the city boundaries.

4. Existing highway facilities including their deficiencies in terms of motor vehicle traffic flows, capacities, access, etc. for the corridor and the immediate vicinity.

5. Basic vehicle-type data including a percentage breakdown by light vehicles, buses and commercial vehicles (trucks) for the corridor and immediate vicinity; basic origin-destination-trip purpose data by type of vehicle for the corridor and immediate vicinity. This data should be supplied for the probable design year, two years after completion of the highway section and through 1990.

6. An inventory of socio-economic factors including population, dwelling units, labor force, employment, per capita income, automobile ownership, retail sales, retail employment, school attendance and enrollment, property values, number and types of commercial and industrial establishments, taxes, etc. for the corridor and immediate vicinity. This data should be supplied for the probable design year, two years after completion of the highway section and through 1990.

7. An estimate of when the proposal will be constructed and the current status of the proposal with a brief historical resume including details of how proposal developed into its present form and status.

8. A vicinity map(s) shall be furnished which will show the proposed corridor and its relationship to surrounding natural and cultural features such as lakes, streams, rivers, mountains, historic sites, landmarks, institutions, developed areas, principal roads and highways, surrounding terrain, existing land use and proposed land use and other existing environmental features that are pertinent to a highway study.

9. Detailed maps, sketches, pictures, and other visual exhibits should be used to show specific environmental involvements as necessary.

b. The probable impact of the proposed development or improvement.

The evaluation and discussion should specifically emphasize significant beneficial and detrimental environmental consequences upon the region and community of building a new highway into or through an area for each alternative corridor including an in depth discussion of the following sections:

1. Effect of the project upon the dependence of the urban dweller upon motor vehicles.

2. Consistency of the project with local and regional mass transit planning and objectives.

3. Consistency of the project with environmentally sound local and regional land use planning.

4. Effect the project will have upon air quality in the immediate vicinity, the central business district, and the metropolitan area during construction, two years after construction and through 1990. This section should include sufficient data for carbon monoxide, hydrocarbons, nitrogen oxides, and lead particulate background concentrations to allow an objective estimate to be made of future levels.

5. Effect of the project upon noise levels in the immediate vicinity, the central business district, and the metropolitan area during construction, two years after construction and through 1990. This section should include sufficient data for background noise levels to allow an objective estimate to be made of future levels.

6. Probable adverse effects upon water quality and solid waste management during and after construction.

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7. Visual impact of the project upon the surroundings including residents, motorists, historical or other sites designated to have special merit, local, or regional beautification and restoration plans and objectives, interference with views or vistas from surrounding areas.

8. Discuss in detail the following impacts, recognizing that new highway construction may be the inducement needed for new industrial, commercial, and residential development along the general corridor route:

   (a) The probable attendant environmental impacts of these developments upon air quality, water quality, noise levels, solid waste management, and quality of life.

   (b) The probable impact of these developments upon environmentally sound local and regional land use planning.

9. Discuss in detail the following impacts, recognizing that new highway construction in urban areas will generally result in relocating large numbers of residents, commercial establishments, and some industries:

   (a) The probable attendant social and economic impacts upon the residents, and commercial and industrial establishments and their employees.

   (b) The probable impact upon the quality of life of those people affected.

   (c) The probable impact of industry that may be forced to move from what may be considered to be an environmentally good location to possibly a less desirable location as related to air quality, water quality, noise levels, and solid waste management.

C. Alternatives

The choice of alternatives to be studied shall be made from the three categories of alternatives presented below:

1. Alternative Corridors - a minimum of three alternative corridor locations shall be studied and discussed in detail as delineated in Sections C.(1).a. and C.(1).b.

2. Alternative Rights-of-Way - a minimum of three alternative studies of the feasibility of using existing rights-of-way, upgrading existing highway facilities, and upgrading existing public transit facilities or systems shall be made and presented in such a manner that an objective evaluation and analysis of estimated costs (social and transportation), engineering factors, transportation requirements through 1990, and environmental consequences may be made from a review of the environmental statement.

3. Alternative Modes of Transportation - from the list of alternative modes of transportation below a minimum of three alternatives shall be chosen and an in-depth study and discussion made and presented in such a manner that an objective evaluation and analysis of estimated costs (social and transportation), engineering factors, transportation requirements through 1990, and environmental consequences may be made from a review of the environmental statement. For each alternative in the list below that is rejected for detailed study a short discussion of the reasons for rejection shall be presented in the environmental statement. The fact that an alternative is not presently in operation, projected for operation, being studied for possible future operation, or have money allocated for operation or study will not be sole grounds for rejection as an alternative to be studied in depth in the environmental statement.

   (a) Improvement of present bus systems.

   (b) Express bus systems.

   (c) Express bus systems with park-and-ride stations.

   (d) Conventional rapid transit systems.

   (e) New mode systems.

   (f) Other feasible public or mass transit systems.

In all cases the choices of alternatives to be studied shall be made in cooperation with the following interested agencies and organizations:

(a) Local governmental agencies.

(b) Regional governmental agencies.

(c) Regional air pollution authorities.

(d) Department of Environmental Quality.

(e) Mass Transit Division, Oregon State Department of Transportation.

(f) Interested citizen's organizations to include environmental groups, local residential, commercial and industrial organizations directly or indirectly affected by the choice of alternatives.

(g) Other interested agencies and organizations.

(2) Contents of Stage II Environmental Statements

a. A description of the proposed highway improvement and its surroundings.

The description should include the following type of information, for each design alternative within the corridor chosen in Stage I:

1. Type of facility to be built; length, width, termini; map showing location of highway and new or existing right-of-way in corridor.

2. Major design features such as number of lanes, access control, location of bridges and interchanges, depressed and elevated sections, capacity, etc.

3. Basic traffic data including trips for the design year and anticipated new trips generated two years after completion of the highway section and through 1990. This information should be included for the highway, interchanges, access roads and other roads and streets in the corridor and immediate vicinity.

4. Basic vehicle-type data including a percentage breakdown by light vehicles, buses and commercial vehicles (trucks) for the design year, two years after completion of the highway section and through 1990. This information should be included for the highway, interchanges, access roads and other roads and streets in the corridor and immediate vicinity.

5. A vicinity map(s) shall be furnished which will show the highway, interchanges and access roads and their relationship to surrounding natural and cultural features such as lakes, streams, rivers, mountains, historic sites, landmarks, institutions, developed areas,

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principal roads and highways, surroundings terrain, existing environmental features that are pertinent to a highway study.

6. Detailed maps, sketches, pictures, and other visual exhibits should be used to show specific environmental involvements as necessary.

b. The probable impact of the proposed development or improvement.

The evaluation and discussion should specifically emphasize significant beneficial and detrimental environmental consequences upon the immediate vicinity for each alternative highway design including an in-depth discussion of the following sections:

1. Effect the project will have upon air quality in the immediate vicinity during construction, two years after construction and through 1990. This section should include sufficient data for carbon monoxide, hydrocarbons, nitrogen oxides, and lead particulate background concentrations to allow an objective estimate to be made of future levels on the highway, at interchanges, on access roads and in the immediate vicinity.

2. Effect of the project upon noise levels in the immediate vicinity during construction, two years after construction, and through 1990. This section should include sufficient data for background noise levels to allow an objective estimate to be made of future levels on the highway, at interchanges, on access roads, and in the immediate vicinity.

3. Effect upon water quality and solid waste management during construction. Study should include discussion of possible beneficial uses of materials removed during construction and probable adverse effects upon community surface water sewage systems and ground water quality.

4. Visual impact of the project upon the surroundings including residents, motorists, historical or other sites designated to have special merit, local or regional beautification and restoration plans and objectives, interference with views or vistas from immediate vicinity and surrounding areas.

C. Alternatives

The study and discussion of design alternatives should be presented as delineated in sections C.(2).a. and C.(2).b. for three alternatives as a minimum. The study should include investigation of the feasibility of use of the facility for mass transit systems, solid waste collection and transfer stations, or other similar uses of benefit to the immediate vicinity and community.

Air Quality Sampling Requirements for Environmental Statements Prepared for Proposed New Highway Construction in Urban Areas as Required in Sections C.(1).b.4 and C.(2).b.1 of the Guidelines.

A. Initial Survey of Corridor Area

1. Sampling gear for gases.

   Use indicator tubes for CO, NO_2 and reactive HC. Tube range should approximate range to be encountered.

2. Sampling gear for particulate.

   Standard Hi-Vol samplers.

3. Sites and sampling periods for gases.

   Minimum 2 sites for each 20 blocks of corridor, one site on up-wind side and one site on down-wind side of corridor.

   Collect one sample each hour from 0600 hours to 1800 hours each day for a minimum of 7 consecutive days. All sites to be run simultaneously.

4. Sites and sampling periods for particulate.

   Minimum 2 sites for each 20 blocks of corridor, one site on up-wind side and one site on down-wind side of corridor.

   Collect one sample each 12 hours from 0600 hours to 1800 hours each day for a minimum of 7 consecutive days. All sites to be run simultaneously.

5. Meteorological data gathering.

   Record temperature and wind speed and direction at each site hourly while site is in operation Days of operation should be chosen to include worst meteorological conditions (i.e. stagnation) if possible.

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Purpose of initial survey is to determine general levels in the corridor area and help in determination of siting of continuous monitors for gases and Hi-Vol samplers.

Site locations will be made in cooperation with regional air pollution authority and DEQ.

B. Long-term Sampling in Corridor Area

1. Sampling gear for gases.

   Indicator tubes for CO, NO_2 and reactive HC.

   Minimum of two continuous monitors for CO, NO_2 and photochemical oxidant.

2. Sampling gear for particulate.

   Standard Hi-Vol samplers.

3. Sites and sampling periods for gases.

   Sites for continuous monitors to be determined from initial survey data in cooperation with regional authorities and DEQ.

   Collect samples continuously for a minimum of 14 consecutive days every other month throughout duration of environmental study to include a minimum of 6 months.

   Sites for indicator tubes to be essentially the same as in initial survey.

   Collect one sample each hour from 0600 hours to 1800 hours each day for a minimum of 7 consecutive days during periods continuous monitors are running. All sites to be run simultaneously.

4. Sites and sampling periods for particulate.

   Sites will be determined from initial survey data.

   Collect one sample each 12 hours from 0600 hours to 1800 hours each day for a minimum of 14 consecutive days every other month throughout duration of environmental study to include a minimum of 6 months.

5. Meteorological data gathering.

Record temperature and wind speed and direction at each site hourly while site is in operation. Days of operation should be chosen to include worst meteorological conditions (i.e. stagnation) if possible.

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY CONTROL DIVISION
1234 S. W. Morrison Street,
Portland, Oregon 97205

GUIDELINES FOR REVIEW OF PROPOSED PARKING FACILITIES IN URBAN AREAS

A. Purpose:

To provide basic guidelines to public and private agencies and individuals regarding the review and approval procedures of the Department for parking facilities proposed for construction in urban areas. The guidelines further provide requirements for the content of environmental impact statements which may be prepared for certain parking facilities at the request of the Department as provided for under OAR, Chapter 340, Section 20-065.

These guidelines are not rules and are not intended to be all inclusive or inflexible,but rather serve as a basis for the interpretation and implementation of OAR, Chapter 340, Sections 20-050 through 20-070.

From time to time, as the Department determines the need, revisions to these guidelines will be published. This is the first revision and supersedes the guidelines dated April 18, 1972.

B. Classes of Parking Facilities Defined:

1. Residential - parking facilities intended primarily for residents or tenants of apartments, condominiums, trailer parks, planned unit developments, and similar residential developments.

2. Employee - parking facilities intended primarily for long-term or commuter parking such as is generally associated with offices, banks, manufacturing establishments and similar developments.

3. Retail/Commercial - parking facilities intended primarily for short-term or shopper parking such as is generally associated with shopping centers, medical/dental offices, hotels, retail and wholesale stores and similar retail/commercial developments.

4. Special - parking facilities intended primarily for long-term or short-term parking during off-peak traffic hours such as is generally associated with drive-in theaters, churches, fraternal organizations, restaurants and similar developments.

5. Joint Use - parking facilities which are combinations of any or all of the above classes of parking facilities and which through appropriate joint use of available parking spaces would require less total parking than would be required if each class were considered individually.

C. Delineation of Areas of Special Concern

Due to the heavy traffic and potential air pollution problems generally associated with city centers, the following areas have been delineated as areas of special concern which may have special review requirements:

1. Portland Central Commercial Area - includes area within loop formed by Stadium Freeway, Fremont Bridge, Eastbank Freeway and Marquam Bridge and south of N. W. Hoyt Street.

2. Salem Central Commercial Area - includes the area bounded by Market Street on the north, the Willamette River on the west, Mission Street on the south, and 12th Street on the east.

3. Eugene Central Commercial Area - includes area bounded by Third Avenue on the north, Jefferson Street on the west, 13th Street on the south, and Mill Street on the east.

4. Other Areas - any area within a grid, 0.2 mile on a side, which has an average annual daily traffic (ADT) volume of 25,000 or more motor vehicles and within the area defined in OAR, Chapter 340, Section 20-060.

Other areas of special concern may be defined at a later date.

D. Environmental Impact Statements May Be Required.

In general, any class of parking facility, other than special, proposed for construction in any of the areas of special concern delineated above, will be required as a minimum to have a professionally prepared environmental impact statement submitted to the appropriate regional air pollution authority and the Department for review.

It should be noted that the area defined as the Portland Central Commercial Area is subject to the provisions of the Portland Transportation Control Strategy, an amendment to the Oregon Clean Air Act Implementation Plan. Parking facilities proposed for this area will not be required to have an environmental impact statement prepared if they obviously comply with the plan.

Further, parking facilities for 500 or more motor vehicles proposed for construction anywhere within the jurisdictional boundaries of OAR, Chapter 340, Section 20-060 will usually be required to submit an environmental impact statement. These jurisdictional boundaries include most of the Portland, Salem and Eugene metropolitan areas at the present time.

Please refer to section G. of this document for the requirements for the content of environmental impact statements for parking facilities.

E. Department Guidelines for Determining Maximum Amount of Parking Allowed by Class of Parking Facility (Not Applicable in Portland Central Commercial Area)

1. Residential - generally, the maximum number of parking spaces allowed will be the minimum number required by the applicable zone code. Exceptions will be considered for parking recreational vehicles, trailers or similar vehicles.

2. Employee - generally, the maximum number of parking spaces allowed will be one space per 400 gross square feet of floor area or 0.59 space per employee whichever is the lesser.

3. Retail/Commercial -

   a. Shopping Centers: generally, the maximum number of parking spaces allowed will be 5.0 spaces per 1000 gross square feet of leaseable area reduced in direct proportion to the percentage of total daily person trips made by transit.

   b. Individual Retail/Commercial: generally the maximum number of parking spaces allowed will be the minimum number required by the applicable zone code reduced in direct proportion to the percentage of total daily person trips made by transit.

4. Special - generally, the maximum number of parking spaces allowed will be the minimum number required by the applicable.zone code.

5. Joint Use - the maximum number of parking spaces allowed will be determined on an individual basis assuming maximum utilization of the concept of joint use and reduced in direct proportion to the percentage of total daily person trips made by transit.

F. Department Guidelines for Determing Adequacy of Transit Service and Incentives.

It is the responsibility of the person or agency proposing construction of parking facilities to contact the appropriate transit agency to determine the levels of existing and planned transit service in the vicinity of their development. The adequacy of transit service is dependent upon the type of development proposed and may be determined by consulting with the transit agency or various transportation consultants. If no transit service is available or existing service is inadequate, it is the responsibility of the applicant to secure adequate service by formally requesting the transit agency to provide service or by providing service by other means. A letter of intent from the transit agency delineating its response to this request will be necessary before approval for construction can be granted.

It is further the responsibility of the applicant to provide appropriate incentives to encourage the maximum use of transit service such that the amount of parking required will be minimized and the air and noise pollution resulting from vehicle trips attracted or generated by the parking facility will also be minimized.

Acceptable transit patronage incentives, which are presently being employed by various applicants are delineated below by class of parking facility:

1. Residential
    a. Provide up-to-date information on bus scheduling and routes.

    b. Construct bus shelters and/or bus turn-out lanes to meet or exceed transit agency specifications.

    c. Make available transit tokens or tickets at reduced rates.

2. Employee
    a. Provide up-to-date information on bus scheduling and routes.

    b. Construct bus shelters and/or bus turn-out lanes to meet or exceed transit agency specifications.

    c. Implement program of employee transit fare reimbursement.

3. Retail/Commercial

    a. Provide up-to-date information on bus scheduling and routes.

    b. Construct bus shelters and/or bus turn-out lanes to meet or exceed transit agency specifications.
    c. Provide transit tokens or tickets at reduced rates for patrons using transit.

4. Joint Use.
    a. Provide up-to-date information on bus scheduling and routes.
    b. Construct bus shelters and/or bus turn-out lanes to meet or exceed transit agency specifications.

    c. Provide combination of incentives listed for other classes corresponding to classes of parking provided.

Other transit incentives may be added at the applicant's option, or different incentives may be substituted for those listed if they are equivalent to the incentives listed or if the incentive listed is not appropriate for the project site.

The applicant should also inform the Department of other non-transit incentives it intends to provide which will tend to reduce the total number of automobile trips to the proposed parking facility. These incentives may include car pool information service, bicycle racks and paths and various pedestrian amenities.

G. Required Content of Environmental Impact Statements for Parking Facilities.

The following sections outline subject matter and content of submission which shall, as a minimum, be covered in environmental impact statements for parking facilities:

1. Description of the Proposed Facility and Its Surroundings

The description should include the following type of information:

a. Type of facility, residential, employee, retail/commercial, special or joint use.

b. Major design features; length, width, height, number of levels, access control, number of vehicles to be stored, etc.

c. Traffic data within 0.2 miles of project site; vehicle trips on access and through streets, existing, projected for completion of construction, two years after completion of construction and subsequently at five-year intervals for fifteen years.

d. A vicinity map(s) shall be furnished which will show the proposed parking facility and its relationship to surrounding natural and cultural features such as hills, parks, historic sites, landmarks, institutions, developed areas, surrounding streets, principal highways and similar features that are pertinent to a parking facility study.

e. General description of surrounding terrain, existing land use and proposed land use (map preferrable), other existing environmental features.

f. A schedule or an estimate of when the proposed facility will be constructed; the current status of the proposal, with a brief historical resume.

g. Existing parking facilities including their deficiences, the need for the proposal, the benefits to the State, region and community.

h. An inventory of economic factors such as employment, taxes, property values, etc., should be included as appropriate.

i. Detailed maps, sketches, pictures, and other visual exhibits should be used to show specific environmental involvements as necessary.

2. The Probable Impact of the Proposed Facility or Improvement Upon Environment.

The evaluation and discussion should specifically emphasize significant beneficial and detrimental environmental consequences upon the State, region or community with specific discussion of the following points:

a. Effect of the project on the dependence of the urban dweller upon motor vehicles.

b. Consistency of the project with local and regional mass transit planning and objectives.

c. Consistency of the project with environmentally sound local and regional land use planning.

d. Effect the project will have upon air quality in the immediate vicinity, central commercial area and metropolitan area during construction, at the completion of construction, two years after completion of construction and at subsequent five-year intervals for fifteen years. Refer to section 4. Air Quality Prediction Methodologies for acceptable air quality prediction techniques.

e. Effect the project will have upon noise levels in the immediate vicinity, central commercial area and metropolitan area during construction, at the completion of construction, two years after completion of construction and at subsequent five-year intervals for fifteen years. Refer to section 5. Noise Level Prediction Methodologies for acceptable noise level prediction techniques.

f. Effect of surface runoff from parking facility on water quality of bodies of water in project vicinity.

3. Alternatives.

The exploration of alternatives should include an objective evaluation and analysis of feasible alternatives with detailed discussion of the following specific areas:

a. Design alternatives that would minimize environmental impact of project.

b. Alternative modes of transportation including public or private mass transit, bicycling, pedestrian modes, and water transit modes. Provide a detailed discussion of the impact of these various modes, in combination with incentives which will be provided to utilize them, on the number of parking spaces required and air and water quality and noise levels.

4. Air Quality Prediction Methodologies

The following references contain air quality prediction techniques which are acceptable to the Department for use in estimating the air quality impact of parking facilities. Other methodologies may be used subject to Department approval:

a. Environmental Protection Agency, "Guidelines for Implementing EPA Requirements for Maintenance of Standards," Draft document as of July 12, 1973.

b. Beaton, J.L., Skog, J.B., Shirley, E.C., and Ranzien, A.J.; California Division of Highways, Report Numbers FHWA-RD-72-33 through 40.

c. Mancuso, R.L., and Ludwig, F.L., "User's Manual for the APRAC-1A Urban Diffusion Model Computer Program," Stanford Research Institute, (Sept. 1972).

5. Noise Level Prediction Methodologies

The following reference contains noise level prediction techniques which are acceptable to the Department for use in estimating the impact of parking facilities on noise levels. Other methodologies may be employed subject to Department approval.

a. Gordon, C.G., Galloway, W.J., Kugler, B.A., and Nelson, D.L., "Highway Noise A Design Guide for Highway Engineers," National Cooperative Highway Research Program Report 117, Highway Research Board, (1971).

D-1

APPENDIX D
PHILADELPHIA
REGULATIONS AND GUIDELINES

D-1-A

Amendment to Air Management Regulation X

Construction Review

March 12, 1974

Air Management Services
Department of Public Health
City of Philadelphia
4320 Wissahickon Avenue
Phila., PA, 19129
215-686-7842

This amendment replaces in it entirety Air Management Regulation X, CONTRUCTION REVIEW, approved August 20, 1972

REGULATION X

Complex Source Review

Section I - Definitions

Complex Source - A facility, building, structure or installation, or combination thereof, that has or leads to secondary or adjunctive activity which emits or may emit a pollutant for which there is a national ambient air quality standard. These sources include, but are not limited to:

1. Shopping Centers;
2. Sports complexes;
3. Drive-in theaters;
4. Parking lots and garages;
5. Residential, commercial, industrial, and institutional developments;
6. Amusement parks and recreational areas;
7. Highway and transportation facilities;
8. Sewer, water, power, and gaslines, and
9. Other such facilities which will result in increased emissions from motor vehicles or stationary sources.

National Ambient Air Quality Standards - Those primary and secondary ambient air quality standards which are promulgated by the Administrator of the United States Environmental Protection Agency.

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Person - Any individual, natural person, syndicate, association, partnership, firm, corporation, institution, agency, authority, department, bureau, or instrumentality of federal, state, or local government or other entity recognized by law as a subject of rights and duties.

Philadelphia CBD - The area within the City of Philadelphia bounded by but not including, Vine Street, South Street, the Schuylkill River, and the Delaware River.

Section II - General Provisions

A. No person shall construct, reconstruct, alter or install any complex source, except as provided in Section II B. before obtaining written approval from the Department for such construction, reconstruction, alteration or installation.

B. The requirements of Section II A. shall not apply to the following complex sources:

1. Commercial or industrial facilities with gross leasable area or floor space less than 500,000 square feet;
2. New or modified parking facilities within the Philadelphia CBD with total capacity of less than 250 motor vehicles and new or modified parking facilities outside of the CBD with total capacity of less than 500 motor vehicles;
3. Facilities of less than one hundred (100) dwelling units or groups of facilities of less than one hundred dwelling units;
4. Such other complex sources as the Department determines to have negligible air quality impact.

C. Nothing contained in this Section shall be taken to excuse or relieve any person from complying with any applicable provision of the Air Management Code or any regulation adopted thereunder.

Section III--Air Quality Impact Review

A. Request for Approval

Request for approval to construct, reconstruct, alter or install any complex source shall be made to the Department by the person responsible for such source and shall include submission of an air quality impact statement sufficiently detailed to show all actual and potential impacts on the existing air quality resulting directly, or indirectly, from the facility at the site, and in the area, neighborhood and region.

B. Review Procedures

1. The Department shall establish procedures and guidelines for use in the preparation, submission and review of air quality impact statements and shall prescribe the information to be supplied in order to determine the effect of the complex source on air quality.
2. Information to be given in the statement shall include, but not be limited to, the following:
    a. Location and general description of the proposed facility or project.
    b. Information on the nature, design, construction and operation of the facility.
    c. Information on the transportation related aspects of the project including mass transit, traffic patterns and parking facilities.
    d. The nature and amounts of air contaminants to be emitted directly from the facility or emitted by associated mobile sources.

Any additional information, evidence or documentation that the Department may require shall be furnished upon request.

3. The Department shall make available for public inspection information submitted by the person responsible for the proposed project or facility, as well as the Department's analysis of the effect on air quality and proposed approval or disapproval, and provide a period of at least thirty (30) days after prominent advertisement for the submittal of public comment.

C. Conditions of Approval

1. Approval to constuct, reconstruct, alter or install any complex source shall be granted only upon demonstration to the satisfaction of the Department that such source will not violate any provision of the Air Management Code or Regulations of the Air Pollution Control Board or prevent or interfere with the attainment or maintenance of any national ambient air quality standard in the neighborhood, area or region.

2. Such approval shall not exempt any person from prosecution for violation of the Air Management Code, Regulations of the Air Pollution Control Board or any applicable laws of the Commonwealth of Pennsylvania or the United States Government.

Section IV - Severability

The provisions of these Regulations are severable and if any provision, sentence, clause, section or part thereof shall be held illegal, invalid, unconstitutional or inapplicable to any person or circumstances, such illegality, invalidity, unconstitutionality or inapplicability shall not affect or impair any of the remaining provisions, sentences, clauses, sections or parts of the ordinance or their application to him or to other persons and circumstances. It is hereby declared to be the legislative intent that these regulations would have been adopted if such illegal, invalid or unconstitutional provision, sentence, clause or aprt had not been included therein, and if the person or circumstances to which the ordinance or any part thereof is inapplicable had not specifically been exempted therefrom.

Section V - Effective Date

Except as otherwise provided, this Regulation shall become effective upon adoption.

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PHILADELPHIA DEPARTMENT OF PUBLIC HEALTH
AIR MANAGEMENT SERVICES
REGULATION X
CONSTRUCTION REVIEW

- AIR QUALITY IMPACT STATEMENT (AQIS) GUIDELINES -

The following guidelines are to be used by persons preparing Air Quality Impact Statements as required by Air Management Regulation X. Complete Section I and either Section II or Section III.

I. GENERAL INFORMATION

A. The statement shall contain the following basic information.
   1. Name and location of proposed facility or project.
   2. Name, complete address and telephone of owner.
   3. Name, complete address and telephone of the developer, architect, or planner.

B. Proposed schedule and deadlines
   1. Planning and design stages.
   2. Anticipated dates of commencement and completion of construction.

C. The statement shall describe the present character and use of the site and surroundings of the proposed project including the present and proposed zoning classifications.

II. STATIONARY SOURCES

A. The statement shall include a list of all proposed stationary source equipment and an itemized estimate in tons per year of air pollutant emissions including estimates of solid waste generation (tons/day) and proposed disposal method.

B. The statement shall contain statement of intent with regard to the requirements of the Air Management Code and Regulations in the following categories:
   1. Compliance with stationary sources and administrative regulations, i.e., Air Management Regulations I, II, III, V, VII, VIII, XI, XII, XIII, and any future Regulations of this type.
   2. The submission of an Emergency Plan as required by Air Management Regulation IV.
   3. Compliance with the Parking Facility Ventilation Criteria as published by Air Management Services.
   4. Compliance with the Construction and Demolition Criteria as published by Air Management Services.

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C. The transportation related aspects of the proposed project or facility shall be described in the following categories:
   1. Location and schedules of existing and/or proposed mass transit facilities, particularly new or revised bus routes.
   2. The effect of the proposed project or facility on local automobile traffic patterns including an estimate of the impact on local air quality.
   3. Location and capacity of proposed off-street parking facilities including entrance and exit locations and provisions for truck deliveries and scheduling.

D. Assumptions should be stated and justified. Enough information and references should be included to enable Air Management Services to duplicate the calculations.

III. HIGHWAY/MASS TRANSIT

A. The statement shall contain a description of the proposed route of the project, number of vehicles or persons using the facility, and the effect of the proposed route or facility on existing routes or facilities (schedules, volume, etc.).

B. The statement shall contain an estimate of the effect on local air quality of the proposed project or facility.

C. If required for the proposed project, the submission of that portion of the federal Environmental Impact Statement dealing with air quality will meet the requirements of this Section.

D. Assumptions should be stated and justified. Enough information and references should be included to enable Air Management Services to duplicate the calculations.

Air Quality Impact Statements are to be submitted to:

Air Management Services
Source Registration--AQIS
4320 Wissahickon Avenue
Philadelphia, Pennsylvania 19129

APPENDIX E
DEVELOPMENTS OF REGIONAL IMPACT (DRI) AND INDIRECT SOURCE REVIEW (ISR): THE FLORIDA EXPERIENCE

E-1-A

DEVELOPMENTS OF REGIONAL IMPACT (DRI) AND INDIRECT SOURCE REVIEW (ISR): THE FLORIDA EXPERIENCE

A developer may seek approval of a Development of Regional Impact under three conditions:

(i) If the proposed development is to be located in an Area of Critical State Concern (legislated by Chapter 380 of the Florida Environmental Land and Water Management Act), it must have a DRI application prepared that shows it will comply with any regulations adopted for the area.[1]

(ii) If the development is to be located in an "unregulated area," that is, an area where local zoning or subdivision regulations have not been adopted, the developer must give 90 days' notice to the local government with jurisdiction and to the Division of State Planning of his intent to undertake a Development of Regional Impact. During this 90-day period, the local government may adopt zoning or subdivision regulations for the area, or the Administration Commission may designate the area as an Area of Critical State Concern. If neither action occurs within the 90-day waiting period, the developer may undertake the DRI without further regard to the Environmental Land and Water Management Act. Approximately 25 percent of the counties in Florida are unregulated, according to a recent survey by the Department of Community Affairs.[2]

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[1] An Area of Critical State Concern is defined as an area containing, or having a significant impact upon, environmental, historical, natural, or archaeological resources of regional or statewide importance; an area significantly affected by, or having a significant effect upon, an existing or proposed major public facility; or a proposed area of major development potential, which may include a proposed site of a new community, designated in the state land development plan.

[2] Bureau of Land Planning, Developments of Regional Impact: A Summary Report of the First Six Months, Tallahassee, Florida, Division of State Planning, February 1974, p. 2.

(iii) If the development is proposed in a "regulated" area where local zoning or subdivision regulations have been adopted, a DRI application must be filed. In regulated jurisdictions, the developer must complete a DRI application for development approval and submit copies to the local government having jurisdiction, to the regional planning agency designated for the area, and to the Division of State Planning. A public hearing is set by the local government, and an advisory report concerning the regional impact of the development is prepared by the regional planning agency for the benefit of the local government. In all cases, it is the local government which makes the final decision on a Development of Regional Impact. Their decision is subject to an administrative appeals process at the state level, heard by the Florida Land and Water Adjudicatory Commission (the Governor and Cabinet), if legal action is initiated through the normal judicial processes of the courts.

DRI became effective on 2 July 1973, six months before ISR was promulgated in Florida. A "grandfather" clause was included in the Environmental Land and Water Management Act to exclude development projects on which construction was begun prior to 2 July 1973. The DRI grandfather clause is based on prior zoning with dedication of subdivision plotting. The ISR grandfather clause, in contrast, is more stringent than the DRI grandfather ruling, since the ISR clause is based on actual site alteration already being under way.

A comparison of the review requirements for DRI and ISR is shown in Exhibit E-1.

EXHIBIT E-1
REQUIREMENTS FOR ISR AND DRI REVIEW

DRI		ISR	
Type of Facility	**Triggering Point**	**Type of Facility**	**Triggering Point**
Airports	New airport, runway, or runway extension	Airports	New airport designed for scheduled commercial traffic.
Attractions and Recreation Facilities	For single performance facilities: 1. Parking for more than 2,500 cars, or 2. Permanent seats for more than 10,000 spectators. For serial performance* facilities: 1. Parking for more than 1,000 cars, or 2. Permanent seats for more than 1,000 spectators.		
Hospitals	1. More than 600 beds, or 2. Serving citizens of more than one county.	Any facility with provisions for large amounts of parking	1. Open parking lots for 1,500 cars or more. 2. Multilevel parking lots for 750 cars or more
Industrial Plants and Industrial Parks	1. Parking for more than 1,500 motor vehicles, or 2. Occupies site greater than one square mile.		
Office Parks	1. Occupies more than 30 acres of land, or 2. Encompasses more than 300,000 square feet of gross floor area.		

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*Using parking or seating facilities more than one time per day on a regular or continual basis.

EXHIBIT E-1 (Cont'd)

DRI		ISR	
Type of Facility	Triggering Point	Type of Facility	Triggering Point
Shopping Centers	1. Occupies more than 40 acres of land, or 2. Encompasses more than 400,000 square feet of gross floor area, or 3. Provides parking spaces for more than 2,500 cars.	Roads	1. 1,000 vehicles/hour or more in Dade, Broward, Palm Beach, Brevard, Hillsborough, Pinellas, Orange, Durval, Escambia, Polk, Leon, Sarasota, Volusia, and Alachua Counties. 2. 2,000 vehicles/hour or more in all other counties.
Residential Developments	[Size of Population of County] — [Number of Dwelling Units] 1. Less than 25,000 — 250 2. 25,000 - 50,000 — 500 3. 50,001 - 100,000 — 750 4. 100,001 - 250,000 — 1,000 5. 250,001 - 500,000 — 2,000 6. More than 500,000 — 3,000	Tollways/interstates/ other major roads	More than two lanes outside of counties named in #1 above.
Schools	1. More than 3,000 full-time students, or 2. Physical expansion having such a design population by at least 20% of the design population.		

EXHIBIT E-1 (Cont'd)

DRI		ISR	
Type of Facility	Triggering Point	Type of Facility	Triggering Point
Electrical Generating Facilities and Transmission Lines	1. Total generating capacity greater than 100 megawatts, or addition to existing electrical generating facility which adds a generating capacity of greater than 100 megawatts. 2. Proposed electrical transmission line with capacity of 230 kilowatts or more that crosses a county line.	Any other facility	As determined by DPC.
Mining Operations	Solid mineral mining operation which annually requires removal or disturbance of solid minerals or overburden from an area, whether or not contiguous, of greater than 100 acres, or for which the proposed consumption of water would exceed 3 million gallons per day.		
Petroleum Storage Facilities	1. Any proposed facility, or combination of facilities, located within 1,000 feet of any navigable water for storage of any petroleum produce with storage capacity of over 50,00 barrels. 2. Any other proposed facility or combination of facilities for storage of any petroleum product with storage capacity of over 200,000 barrels.		
Port Facilities	Any water port, except those designed primarily for the mooring or storage of watercraft used exclusively for sport or pleasure of less than 100 slips for moorings.		

F-1

APPENDIX F
DESIGN CHANGE COSTS

A. Introduction

Road and mass transit design change costs vary with the type and quality of materials used, the structural design requirements, and the right-of-way costs incurred. Material and labor prices have been increasing at a rapid rate in recent years, as illustrated by the historical average of construction costs shown in Exhibit F-1. The exhibit also points out the variation in costs from one part of the country to another.

Structural design requirements vary with state regulations and the anticipated needs of the transportation system. However, more important, the cost of design changes is contingent on specific site characteristics. Such factors as subsurface geologic conditions, drainage, and other underground structures largely determine whether and how much the original estimated cost will increase as a result of unfavorable conditions. Because of the increased costs of construction when subsurface structures and utilities must be removed or relocated, the cost of construction and modification in densely populated areas can be five to eight times the cost of similar construction or modification in rural areas.[1]

While some improvements may be constructed without acquisition of additional rights-of-way, when additional land is required construction costs can increase greatly as indicated in Exhibits F-2 and F-3.[2] The fact that right-of-way costs often appear to increase with population indicates the impact which development has on land and construction costs. In some cases, the rights-of-way simply cannot be acquired at any price. This is often the case in central cities where buildings stand very close to existing roads and transit routes.

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[1] Interview with Donald Whittemore, McKee-Berger-Mansueto, Inc., Boston, Massachusetts, June 1974.

[2] While Exhibits F-2 and F-3 represent right-of-way costs for roadway design changes, they also illustrate the possible cost impact of mass transit right-of-way taking.

EXHIBIT F-2
HISTORICAL AVERAGE OF CONSTRUCTION COSTS

Average 1973 Construction Cost & Labor Indexes						Historical Average	
City	Labor	Total	City	Labor	Total	Year	Index
Akron, Oh.	110	107	Memphis, Tn.	81	83	1973	100
Albany, N.Y.	102	100	Miami, Fl.	102	100	1972	93
Albuquerque, N.M.	80	89	Milwaukee, Wi.	105	107	1971	86
Amarillo, Tx.	74	83	Minneapolis, Mn.	101	100	1970	78
Anchorage, Ak.	133	136	Mobile, Al.	89	89	1969	71
Atlanta, Ga.	87	91	Montgomery, Al.	67	74	1968	66
Baltimore, Md.	96	100	Montreal, Cn.	72	83	1967	62
Baton Rouge, La.	83	87	Nashville, Tn.	75	82	1966	60
Billings, Mt.	82	88	Newark, N.J.	116	107	1965	57
Birmingham, Al.	79	86	New Haven, Ct.	103	101	1964	56
Boise, Id.	83	88	New Orleans, La.	85	92	1963	55
Boston, Ma.	105	103	New York, N.Y.	129	115	1962	54
Bridgeport, Ct.	104	102	Norfolk, Va.	71	78	1961	53
Buffalo, N.Y.	112	110	Oklahoma City, Ok.	83	86	1960	52
Burlington, Vt.	81	87	Omaha, Nb.	91	91	1959	51
Charleston, W.V.	89	95	Peoria, Ill.	95	97	1958	50
Charlotte, N.C.	68	75	Philadelphia, Pa.	109	102	1957	49
Chattanooga, Tn.	78	84	Phoenix, Az.	102	100	1956	47
Chicago, Ill.	110	104	Pittsburgh, Pa.	108	103	1955	44
Cincinnati, Oh.	107	104	Portland, Me.	75	83	1954	42
Cleveland, Oh.	117	109	Portland, Or.	94	98	1953	42
Columbia, S.C.	64	70	Providence, R.I.	98	101	1952	41
Columbus, Oh.	104	100	Raleigh, N.C.	66	74	1951	40
Dallas, Tx.	84	87	Richmond, Va.	71	77	1950	37
Dayton, Oh.	104	102	Rochester, N.Y.	108	107	1949	35
Denver, Co.	93	90	Rockford, Ill.	97	92	1948	35
Des Moines, Ia.	91	93	Sacramento, Ca.	110	109	1947	32
Detroit, Mi.	119	110	St. Louis, Mo.	106	101	1946	27
Duluth, Mn.	98	97	Salt Lake City, Ut.	87	92	1945	23
Edmonton, Cn.	74	84	San Antonio, Tx.	78	83	1944	22
El Paso, Tx.	67	78	San Diego, Ca.	106	105	1943	22
Erie, Pa.	100	100	San Francisco, Ca.	117	108	1942	21
Evansville, In.	91	92	Savannah, Ga.	68	79	1941	20
Flint, Mi.	103	102	Scranton, Pa.	93	94	1940	18
Fort Wayne, In.	94	93	Seattle, Wa.	96	95	1939	18
Fort Worth, Tx.	83	88	Shreveport, La.	77	83	1938	17
Fresno, Ca.	104	107	Sioux Falls, S.D.	79	89	1937	17
Gary, In.	104	102	South Bend, In.	96	97	1936	16
Grand Rapids, Mi.	93	93	Spokane, Wa.	92	97	1935	15
Harrisburg, Pa.	93	91	Springfield, Ma.	99	97	1934	14
Hartford, Ct.	103	100	Syracuse, N.Y.	101	102	1933	13
Honolulu, Hi.	92	102	Tampa, Fl.	83	88	1932	13
Houston, Tx.	86	89	Toledo, Oh.	110	108	1931	14
Indianapolis, In.	97	96	Topeka, Ks.	91	95	1930	17
Jackson, Ms.	68	75	Toronto, Cn.	92	91	1929	16
Jacksonville, Fl.	78	83	Trenton, N.J.	111	104	1928	16
Kansas City, Mo.	102	97	Tucson, Az.	99	98	1927	16
Knoxville, Tn.	77	81	Tulsa, Ok.	81	87	1926	16
Lansing, Mi.	100	100	Vancouver, Cn.	86	91	1925	16
Las Vegas, Nv.	105	103	Washington, D.C.	99	96	1924	16
Little Rock, Ar.	74	80	Wichita, Ks.	85	91	1923	16
Los Angeles, Ca.	112	103	Winnipeg, Cn.	62	84	1922	15
Louisville, Ky.	93	96	Worcester, Ma.	103	91	1921	16
Madison, Wi.	95	98	Yonkers, N.Y.	114	105	1920	20
Manchester, N.H.	85	88	Youngstown, Oh.	103	101	1919	17

Source: Building Construction Cost Data, Means, 1974, p. 216.

EXHIBIT F-2
EXPRESSWAY AND FREEWAY LAND COSTS
(Million $ Per Lane Mile)

		POPULATION GROUPS (1000's)					
Facility Type	Location	0-50	50-100	100-250	250-500	500-1000	Over 1000
NEW ROADS(1)	CBD	0.36	0.36	0.43	0.54	0.72	1.11
	Fringe	0.36	0.36	0.39	0.43	0.54	0.72
	Residential	0.32	0.32	0.36	0.36	0.46	0.64
RECONSTRUCTION(2)	CBD	0.36	0.36	0.43	0.51	0.69	1.04
	Fringe	0.19	0.19	0.21	0.23	0.28	0.36
	Residential	0.16	0.16	0.17	0.19	0.20	0.26
MAJOR WIDENING(3)	CBD	0.28	0.28	0.30	0.34	0.39	0.51
	Fringe	0.14	0.14	0.17	0.20	0.24	0.34
	Residential	0.04	0.04	0.06	0.09	0.16	0.30

(1) New roads refers to the cost of land needed to construct an entirely new roadway; it assumes no land has been purchased before-hand.

(2) Reconstruction refers to that cost of land needed to construct a new roadway by partially using existing land and partially obtaining more in order to straighten highway curves, provide shoulders, etc.

(3) Major widening refers to that cost of land needed to increase the surface area of an existing roadway.

Notes: Costs reflect 1973 price levels.
The above data reflect a per lane cost.

Source: K. Bhatt and M. Olson, Capacity and Cost Inputs for Community Aggregate Planning Model (CAPM), Working Paper 5002-3, The Urban Institute, Washington, D. C., December 1973.

EXHIBIT F-3
ARTERIAL LAND COSTS
(Million $ Per Lane Mile)

		POPULATION GROUP (1000's)					
Facility Type	Location	0-50	50-100	100-250	250-500	500-1000	Over 1000
NEW ROADS(1)	CBD	0.32	0.32	0.36	0.41	0.52	0.75
	Fringe	0.29	0.29	0.31	0.33	0.39	0.49
	Residential	0.17	0.17	0.18	0.19	0.21	0.27
RECONSTRUCTION(2)	CBD	0.11	0.11	0.11	0.13	0.14	0.19
	Fringe	0.09	0.09	0.09	0.10	0.11	0.14
	Residential	0.17	0.07	0.07	0.09	0.10	0.11
MAJOR WIDENING(3)	CBD	0.16	0.16	0.19	0.23	0.33	0.54
	Fringe	0.16	0.16	0.19	0.22	0.24	0.32
	Residential	0.09	0.09	0.10	0.11	0.16	0.26

(1) New roads refers to the cost of land needed to construct an entirely new roadway; it assumes no land has been purchased before-hand.

(2) Reconstruction refers to that cost of land needed to construct a new roadway by partially using existing land and partially obtaining more in order to straighten highway curves, provide shoulders, etc.

(3) Major widening refers to that cost of land needed to increase the surface area of an existing roadway.

Notes: Costs reflect 1973 levels.

The above data reflect a per lane cost.

Source: K. Bhatt and M. Olson, Capacity and Cost Inputs for Community Aggregate Planning Model (CAPM), Working Paper 5002-3, The Urban Institute, Washington, D.C., December 1973.

B. Roadway Design Change Costs

Exhibit F-4 illustrates the relative costs of various design changes and their effectiveness in increasing the capacity of a road. The costs shown are intended only as an indication of magnitude to allow comparison with the estimate of effectiveness. As indicated, costs can vary tremendously from area to area and within an area, depending on the design and structural requirements of a project.

Exhibits F-5 and F-6 further specify the magnitude of costs involved in road construction and modification. Actual costs are estimated on a unit price basis. The cost per unit is multiplied by the quantity required (that is, fine grading and compacting of subgrade areas: 4,350 square yards at $.50 per square yard), and then all of the project costs are added together. Exhibit F-7 indicates the type of costs associated with traffic control design changes. The unit costs and their usage which were assumed in this study are shown in Exhibit F-8.

EXHIBIT F-4
RELATIVE COSTS OF ROAD IMPROVEMENTS VS. EFFECTIVENESS IN INCREASING CAPACITY

Design Change	Relative Costs	Effectiveness
Right Turn Off of Existing Roadway	$ 10,000	Nil
New Traffic Signals	$ 15,000	Safety, no increase in thru traffic
Traffic Officer	$ 100/day	Safety, approx. 5 to 10% increase in thru traffic or 100 vph
Left Turn Storage	$ 50,000, no road width $ 150,000, with road width	Safety 15 to 20% increase in thru traffic
Widening Roads 10' to 12'	Indeterminate	500 vph
a. Eliminate Parking	Political	500 vph
Revised Signalization	$ 40,000	5% increase in thru traffic
Change Limited Access	--	Very effective, approx. 40% increase in thru traffic
Grade Separation	$2,000,000	Side road: 40% increase Thru traffic: 20% increase
New Feeder Roads	--	Depends on traffic count
Improve Bridges	Span to 50': $100,000 Over 50': $1,000,000	30 to 40% increase in thru traffic
New Bridges	$ 200,000 to $3-5,000,000	Depends on road network
New Freeways	--	100% in thru traffic or 5,000 vph

Source: Donald Whittemore, McKee-Berger-Mansueto, Inc., Boston, Massachusetts, June 1974.

EXHIBIT F-5
EXPRESSWAY AND FREEWAY CONSTRUCTION COSTS
(Million $ Per Lane Mile)

Facility Type	Location	POPULATION GROUP (1000's) 0-50	50-100	100-250	250-500	500-1000	Over 1000
NEW ROAD(1)	CBD	1.04	1.04	1.07	1.10	1.14	1.24
	Fringe	0.71	0.71	0.75	0.81	0.94	1.20
	Residential	0.62	0.62	0.62	0.65	0.71	0.84
RECONSTRUCTION(2)	CBD	1.12	1.12	1.13	1.14	1.18	1.26
	Fringe	0.62	0.62	0.64	0.65	0.68	0.71
	Residential	0.51	0.51	0.52	0.55	0.60	0.68
MAJOR WIDENING(3)	CBD	1.08	1.08	1.10	1.20	1.27	1.48
	Fringe	0.78	0.78	0.81	0.88	1.04	1.33
	Residential	0.62	0.62	0.65	0.70	0.79	0.98

(1) New Roads refers to those costs needed to construct an entirely new roadway where none existed before-hand.

(2) Reconstruction refers to those costs typical of constructing a roadway partially over an existing one and over an area where none existed.

(3) Major widening refers to those costs associated with increasing the capacity of an existing roadway by widening it.

Notes: Costs reflect 1973 price levels.

The above data reflect a per lane cost.

EXHIBIT F-6
ARTERIAL CONSTRUCTION COSTS
(Million $ Per Lane Mile)

Facility Type	Location	POPULATION GROUPS (1000's) 0-50	50-100	100-250	250-500	500-1000	Over 1000
NEW ROADS(1)	CBD	0.33	0.33	0.36	0.39	0.46	0.56
	Fringe	0.29	0.29	0.30	0.33	0.36	0.46
	Residential	0.26	0.26	0.27	0.29	0.33	0.38
RECONSTRUCTION(2)	CBD	0.33	0.33	0.35	0.36	0.40	0.49
	Fringe	0.30	0.30	0.31	0.33	0.35	0.39
	Residential	0.28	0.28	0.29	0.29	0.31	0.33
MAJOR WIDENING(3)	CBD	0.33	0.33	0.36	0.39	0.42	0.55
	Fringe	0.31	0.31	0.33	0.34	0.39	0.45
	Residential	0.31	0.31	0.33	0.34	0.39	0.45

(1) New roads refers to those costs needed to construct an entirely new road where none previously existed.

(2) Reconstruction refers to those costs typical of constructing a roadway partially over an existing one and over an area where none existed.

(3) Major widening refers to those costs associated with increasing the capacity of an existing roadway by widening it.

Notes: Costs reflect 1973 price levels.

The above data reflect a per lane cost.

Source: K. Bhatt and M. Olson, Capacity and Cost Inputs for Community Aggregate Planning Model (CAPM). Working Paper 5002-3, The Urban Institute, Washington, D. C., December 1973.

EXHIBIT F-7
COSTS ASSOCIATED WITH TRAFFIC CONTROL DESIGN CHANGES

Type of Control	Sources of Costs
Traffic signal	1. Controller 2. Signal heads 3. Poles 4. Pedestrian controls 5. Turning arrows 6. Conduit 7. Street excavation to place conduit 8. Software for computer-controlled systems
Regulatory, warning, and guide signs	1. Panel 2. Supports
Pavement markings	1. Length of marking 2. Width of marking

EXHIBIT F-8

UNIT COST AND USE

ROADS & WALKS Incl. Subs O & P	CREW	DAILY OUTPUT	UNIT	MAT.	INST.	TOTAL
ASPHALT BLOCKS premolded 6" x 12" or 5" x 12", 1¼" thick	D-1	170	S.F.	.70	1.10	1.80
3" thick		160		1.10	1.15	2.25
Hexognonal file, 8-1/2" wide, 1-1/4" thick		140		.75	1.30	2.05
2" thick		140		.90		2.20
Add for terrazzo finish						.30
BASE prepare and roll subbase, small areas	B-10	455	S.Y.		.50	.50
Large areas		650			.35	.35
BASE COURSE Select gravel @ $3.25 per ton, 3" deep		455		.40	.50	.90
6" deep		415		.75	.55	1.30
9" deep		380		1.10	.60	1.70
12" deep		325		1.50	.70	2.20
For soil cement treatment, add			S.Y.	.20	.15	.35
Liquid applications, emulsion			Gal.	.30	.15	.45
Prime and seal			Gal.	.30	.10	.40
Macadam penetration, 2 gal. per S.Y., 4" thick			S.Y.	.60	1	1.60
6" thick, 3 gal. per S.Y.			S.Y.	.90	1.20	2.10
8" thick, 4 gal. per S.Y.				1.20	1.40	2.60
BITUMINOUS paving, wearing course, 1-1/2" thick	B-25	955		.80	1.20	2
3" thick		760		1.70	1.50	3.20
Base course, 1" thick		955		.60	1.20	1.80
2" thick		915		1.20	1.25	2.45
3" thick		760		1.70	1.50	3.20
4" thick		655		2.20	1.75	3.95
Sand finish course, 3/4" thick		1040		.75	1.10	1.85
1" thick		955		1	1.20	2.20
Gravel surfacing on asphalt, screened and rolled				.15	.20	.35
Plus sealer and binder				.20	.30	.50
BITUMINOUS CONCRETE At the plant (150 lb. per C.F.)			Ton	8.50		
All weather patching mix				9.50		
Colored mix, 1/2" thick			Ton	100	35	135
			S.Y.	5	1.75	6.75
BRICK PAVING Remove and re-lay brick pavement on sand	D-1	18	S.Y.		10	10
BRIDGES, pedestrian, steel truss, 60' span over streams, etc., including foundations, 10' wide			Total			9,800
Over roadways, enclosed top and sides with chain link fencing, 64' span. Incl. ramps & foundations, 10' wide			"			13,000
Overpasses, rule of thumb: complete in place, 40' span			S.F. deck			8.50
60' span						9
Precast concrete bridges, complete in place, 60' span						7
100' span						8.25
120' span						9
150' span						12
Steel trussed or arch spans, complete in place, 100' span						10
150' span						10.50
200' span						11.25
250' span						12
CALCIUM CHLORIDE delivered 100 lb. bags, carload lots			Ton	60		
Truckload lots				75		
Solution, 4 lb. flake per gallon, tank truck delivery			Gal.	.30		
CONCRETE PAVING with mesh, not incl. base, joints or finish, 4" thick	B-26	755	S.Y.	3.40	1.30	4.70
5" thick		700		4.20	1.40	5.60
6"		675		4.80	1.45	6.25
8"		595		6.30	1.65	7.95
10"		545		7.60	1.80	9.40
12"		490		9	2	11
Finishing, broom finish, add to above	2 Cement Finisher	135			1.50	1.50
Belt dragged, add to above		285			.70	.70

EXHIBIT F-8 (Cont'd)

ROADS & WALKS Incl. Subs O & P cont'd.	CREW	DAILY OUTPUT	UNIT	MAT.	INST.	TOTAL
CONCRETE PAVING cont'd. Curing, add to previous page			S.Y.	.18	.09	.27
Expansion joints, see p. 60						
Reinforcing steel mats, #6@8" O.C.			"			3.20
#9@8" O.C.						4.10
Coloring concrete, black, brown, add			C.Y.			4
Red, green, blue, add						7
CURBS Asphalt, plain, berm	B-27	245	L.F.	.05	1.45	1.50
With asbestos fibers	B-27	215		.10	1.65	1.75
Concrete, 6" x 18", cast in place	B-28	95	↓	2.75	2.75	5.50
Precast	↓	140	↓	2.60	2	4.60
With 18" gutter, plain, precast	↓	140	↓	3	2	5
With reinforcing	↓	140	↓	3.65	2	5.65
For curves, add			↓			25%
Granite, split face, straight, 5" x 16"	B-29	285	↓	3.50	2.75	6.25
6" x 18" (see also p. 76)	↓	285	↓	4		6.75
Radius curbing, 6" x 18", over 10' radius	↓	225	↓	5.30	3.50	8.80
Corners, 2' radius	↓	39	↓	17	20	37
Edging, 4-1/2" x 12", straight	↓	394	↓	1.50	2	3.50
Curb inlets (guttermouth)	↓	39	↓	40	20	60
FILL Borrow. Load, 1 mile haul, compact and shape for embankments			C.Y.			1.75
As above but select fill for shoulders			C.Y.			3.75
For hauling over 1 mile, add to above per C.Y. per			Mile			.20
FINE GRADE area to be paved, small area			S.Y.			.40
Large area						.25
GUARD RAIL Corrugated steel, galv. steel posts, 12'-6" O.C.	B-2	130	L.F.	3.90	3	6.90
Concrete posts	↓	156		2.30	2.50	4.80
For galvanized end sections, add	↓	78	Ea.	18	5	23
Timber guard rail, 4" x 8" with wood posts, treated	↓	435	L.F.	2.80	.90	3.70
Cable guard rail, 3 @ 3/4" cables, steel posts	↓	355	L.F.	3	1.10	4.10
Wood posts	↓	390		2.50	1	3.50
Guide rail, steel box beam, 6" x 6"	↓	140	"	5.50	2.75	8.25
Median barrier, steel box beam, 6" x 8"	↓	135		7	2.90	9.90
Impact barrier, barrel type	↓	195	Ea.	5	2	7
Resilient guard fence & light shield, 6' high	↓	130	L.F.	10.25	3	13.25
PAINTING lines on pavement, reflectorized white, 4" wide			L.F.			.05
8" wide						.09
12" wide			↓			~~.15~~
Reflectorized white, hot thermoplastic, 4" wide			↓			.35
8" wide			↓			.75
12" wide			↓			1.10
Parking stall, paint, white			Stall			1.65
Street letters, arrows and numbers, paint, white			Ea.			2.25
Figures with hot thermoplastic, .090" thick, white			L.F.			1.25
Lane tape, pressure sensitive, 4" wide, white						.55
Colored painting, yellow			L.F. or	12%		
Add to above for other colors			Ea.	20%		
PARKING barriers, timber with saddles, treated type 4" x 4" for cars	B-2	520	L.F.	1.25	.75	2
6" x 6" for trucks	↓	520	L.F.	2	.75	2.75
Folding with individual padlocks	↓	50	Ea.	35	8	43
Flexible fixed stanchion, 2' high, 3" diameter	↓	100	Ea.	8	4	12
Parking lot control, see p. 164	↓					
Precast concrete, 12" x 6", with dowels	↓	520	L.F.	1.60	.75	2.35
Traffic cones and barricades, see p. 4						

EXHIBIT F-8 (Cont'd)

ROADS & WALKS Incl. Subs O & P cont'd.	CREW	DAILY OUTPUT	UNIT	MAT.	INST.	TOTAL
SEALCOATING 2 coat tar pitch emulsion, over 10,000 S.Y.	B-1	2400	S.Y.	.11	.10	.21
Under 1000 S.Y.		1100		.12	.21	.33
Petroleum resistant, over 10,000 S.Y.	↓	2400	↓	.14	.10	.24
Under 1000 S.Y.		1100		.15	.21	.36
Non-skid pavement renewal, over 10,000 S.Y.	↓	2200	↓	.17	.11	.28
Under 1000 S.Y.		1100		.18	.22	.40
Prepare and clean surface for above			S.Y.			.05
Hand seal bituminous curbing			L.F.			.15
SIDEWALKS Bituminous, no base included, 1-1/2" thick			S.F.			.35
2" thick						.45
Brick on sand bed laid flat, 4.5 per S.F.	D-1	84	↓	.45	2.20	2.65
Laid on edge, 7.2 per S.F.		52		.70	3.50	4.20
For concrete bed and joints, add						.58
Concrete, cast in place with mesh, no base, 4" thick	B-24	700		.35	.40	.75
5" thick	↓	680		.45	.41	.86
6" thick		665		.50	.42	.92
Exposed aggregate finish, add to above						.30 to 1.25
Precast concrete, patio blocks, 2" thick, natural	D-1	265		.25	.70	.95
Colors	↓	265		.30		1
Exposed local aggregate, natural		265		.35	.70	1.05
Colors		265		.42		1.12
Exposed granite or limestone aggregate		265		.50	.70	1.20
Exposed white tumblestone aggregate		265		.60		1.30
Crushed stone, 3" thick, white marble	2 Labor	857		.12	.18	.30
Bluestone		857		.09		.27
Flagging, bluestone, 1" thick, irregular	D-1	82		1.50	2.25	3.75
Snapped rectangular	↓	92		1.90	2	3.90
Snapped random rectangular, 1-1/2" thick		84		1.50	2.20	3.70
2" thick		84		2		4.20
Slate, natural cleft, irregular, 3/4" thick		92		.60	2	2.60
Random rectangular, 1/2" thick		106		1.25	1.75	3
Random rectangular, gauged 1/4" thick		116		1.40	1.60	3
For sand rubbed finish, add				.60		
For interior setting, add					25%	
Granite blocks, 3-1/2" x 3-1/2" x 3-1/2"	D-1	92		1.50	2	3.50
4" to 12" long, 3" to 5" wide, 3" to 5" thick	↓	97		1.10	1.90	3
6" to 15" long, 3" to 6" wide, 3" to 5" thick		106		.80	1.75	2.55
Sugar cane, on sand, 2" thick	2 Labor	770		.20	.20	.40
Wood chips, average 2-1/2" thick		1400		.11	.11	.22
Redwood, prefabricated, 4' x 4' sections	F-2	316		1.20	.70	1.90
Redwood planks, 2" thick, on sleepers		246		1.35	.90	2.25
SIGNS, stock. Stop signs, 24" x 24", no posts, steel, plain	2 Labor	25	Ea.	9	6	15
Reflective				11		17
36" x 36", plain	↓	25	↓	18	6	24
Reflective				30		36
Miscellaneous directional signs, 12" x 18", plain		25		5	6	11
Reflective				11		17
18" x 24", stock signs, plain		25		9	6	15
Reflective				18		24
24" x 30", stock signs, plain		25		18	6	24
Reflective				33		39
Add to above for steel posts, galvanized, 7'-6" long		75		5	2	7
12'-0" long		50		9	3	12
Highway instructional road signs, over 20 S.F., including poles & foundations						
Plain	2 Labor	125	S.F.	1.75	1.25	3
Reflective		125		2.30		3.55
Suspended over road, 30 S.F. minimum, plain	↓	60	"	3.00	2.50	5.50
Reflective		60		3.50		6

EXHIBIT F-8 (Cont'd)

ROADS & WALKS Incl. Subs O & P cont'd.	CREW	DAILY OUTPUT	UNIT	MAT.	INST.	1
STEPS Including excavation and concrete base, 12" wide with bricks	D-1	23	L.F. riser	3.50	8	11.50
Railroad Ties	2 Carp.	70	"	2	3	5
Blue stone treads, 12" x 2" or 12" x 1-1/2"	D-1	65		2.75	2.85	5.60
Concrete, cast in place, see p. 59						
Precast concrete, see p. 64						
TERRACES compared to sidewalks above, deduct			S.F.			10%
TRAFFIC SIGNALS Mid block pedestrian crosswalk, with push button and mast arms			Total			6,000
Intersection, 8 signals (2 each direction), programmed			↓			8,000
Semi actuated, detectors in side street only, add			↓			6,000
Fully actuated, detectors in all streets, add			↓			10,000
For pedestrian push button, add			Signal			2,000
School flashing system, programmed						3,000

GENERAL Prices given in this book are of two kinds: (1) BARE COSTS to which an allowance for Contractor overhead and profit must be added and (2) COSTS INCL. SUBS O & P, to which an allowance covering only the General Contractors mark-up must be applied. Items that are nearly always sub-contracted are priced to include the Subs overhead and profit. The general contractor includes this price in his bid with a normal mark-up ranging from 0 to 10%. The mark-up depends on economic conditions plus the supervision and trouble shooting expected by the General Contractor. For purposes of this book it is best to add an allowance of 10% to all items that already include the Subs O & P. For items that do not include Subs O & P, experience shows that an addition of 25% for General Contractors O & P gives best results.

OVERHEAD AND PROFIT Breakdowns on pages 217 to 222 give details on overhead and indicate that it will run 18% to 20% for General Contractors. For an engineering estimate a profit margin of 5% to 7% seems reasonable, so an allowance of 25% should be added to all bare (costs that do not include Subs O & P) costs in the book. A general contractor should be able to tell from his records very closely what his own overhead will be. He will then add whatever profit and contingency percentage circumstances dictate. Subcontractors overhead and profit allowances are detailed on p. 218. These are general figures and local deviations are certainly to be expected.

SUBCONTRACTORS Usually a considerable portion of all big jobs is subcontracted. In fact the percentage done by Subs is constantly increasing and may run over 90%. Since the workmen employed by these companies do nothing else but install their particular product they soon become experts in that line. The result is, installation by these firms is accomplished so efficiently that the total in-place cost, even with the subcontractor's overhead and profit, is no more and often less than if the principal contractor had handled the installation himself. There is, moreover, the big advantage of having the work done right. Companies who sell the specialties are anxious that their product perform well and consequently the installation will be the best possible.

CONTINGENCIES: The allowance for contingencies generally is to provide for unforeseen construction difficulties. On alterations or repair jobs 20% is none too much. If drawings are final and only field contingencies are being considered 2% or 3% is probably sufficient and often nothing need be added. As far as the contract is concerned future changes in plans will be covered by extras. The contractor should consider inflationary price trends and possible material shortages during the course of the job. If drawings are not complete or approved or a budget cost is wanted it is wise to add 5% to 10%. Contingencies then are a matter of judgment.

EXHIBIT F-8 (Cont'd)

EQUIPMENT The power equipment required for each crew is included in the particular crew cost. The daily equipment costs are usually the sum of the weekly rental rate divided by 5 plus the hourly operating cost times 8. (See p. 222 for further discussion and p. 223 for an example of how the daily costs are figured.) For daily costs incl. Subs O & P, 10% is added to the base costs to allow for the contractors mark-up on the equipment costs.

DAILY OUTPUT To the right of the crew column is the Daily Output column. This is the number of units that a given crew will install in an 8 hour day. In other words, the total daily crew cost divided by the Daily Output will produce the unit installation costs. To calculate the unit equipment cost, divide the daily equipment costs by the Daily Output.

UNIT To the right of the Daily Output column is the Unit column which describes the unit upon which the price, production and crew are based, as S.F. (square foot), etc. See p. 279 for a list of abbreviations.

MAT In the next column headed MAT is the unit material cost for the item.

INST. This column is the installation cost which includes labor and equipment. As mentioned above this cost is arrived at by dividing the daily crew or labor cost by the Daily Output.

TOTAL In the last column is the total cost which is the arithmetical sum of the two previous columns.

SPECIAL On a few pages the column headings are EQUIP. and LABOR. The EQUIP. column includes equipment, rental and operating cost while the LABOR column represents the labor to operate the equipment.

EXHIBIT F-8 (Cont'd)

Crew B-1	Hr.	Daily	Hr.	Daily
1 Foreman	$7.65	$ 61.20	$10.35	$ 82.80
2 Building Labor	7.15	114.40	9.65	154.40
24 M.H., Daily Total		$175.60		$ 237.20

Crew B-2	Hr.	Daily	Hr.	Daily
1 Foreman	$7.65	$ 61.20	$10.35	$ 82.80
4 Building Labor	7.15	228.80	9.65	308.80
40 M.H., Daily Total		$290.00		$ 391.60

Crew B-10	Hr.	Daily	Hr.	Daily
1 Equip. Oper. (med.)	$9.75	$ 78.00	$13.45	$ 107.60
.5 Building Labor	7.15	28.60	9.65	38.60
Equipment as specified				
12 M.H., Daily Total (labor only)		$ 106.60		$ 146.20

Crew B-24	Hr.	Daily	Hr.	Daily
1 Cement Finisher	$ 9.45	$ 75.60	$12.55	$ 100.40
1 Building labor	7.15	57.20	9.65	77.20
1 Carpenter	9.60	76.80	12.85	102.80
24 M.H., Daily Total		$209.60		$ 280.40

Crew B-25	Hr.	Daily	Hr.	Daily
1 Foreman	$ 7.65	$ 61.20	$10.35	$ 82.80
7 Building labor	7.15	400.40	9.65	540.40
2 Equip. Oper. (med.)	9.75	156.00	13.45	215.20
1 Paving machine		230.60		253.60
1 - 8 ton Roller		48.80		53.70
80 M.H., Daily Total		$897.00		$1145.70

Crew B-26	Hr.	Daily	Hr.	Daily
1 Foreman	$ 7.65	$ 61.20	$10.35	$ 82.80
6 Building labor	7.15	343.20	9.65	463.20
1 Equip. Oper. (med.)	9.75	78.00	13.45	107.60
Paving machine & trucks		300.00		330.00
88 M.H., Daily Total		$782.40		$ 983.60

Crew B-27	Hr.	Daily	Hr.	Daily
1 Foreman	$ 7.65	$ 61.20	$10.35	$ 82.80
3 Building labor	7.15	171.60	9.65	231.60
1 Berm machine		35.60		39.10
32 M.H., Daily Total		$268.40		$ 353.50

Crew B-28	Hr.	Daily	Hr.	Daily
2 Carpenters	$ 9.60	$153.60	$12.85	$ 205.60
1 Building labor	7.15	57.20	9.65	77.20
24 M.H., Daily Total		$210.80		$ 282.80

Crew B-29	Hr.	Daily	Hr.	Daily
Crew B-2 from above		$290.00		$ 391.60
1 Operator	$ 9.75	78.00	$13.45	$ 107.60
1 Oiler	8.85	70.80	12.20	97.60
1 Gradall, 3 ton		175.20		192.70
56 M.H., Daily Total		$614.00		$ 789.50

EXHIBIT F-8 (Cont'd)

Crew D-1	Hr.	Daily	Hr.	Daily
1 Brick Layer	$10.10	$ 80.80	$13.45	$107.60
1 Brick Layer helper	7.30	58.40	9.75	78.00
16 M.H., Daily Total		$139.20		$185.60

Crew F-2	Hr.	Daily	Hr.	Daily
2 Carpenters	$ 9.60	$ 153.60	$12.85	$ 205.60
Power Tools		14.40		15.85
16 M.H., Daily Total		$ 168.00		$ 221.45

Source: Robert S. Godfrey, Ed., Building Construction on Cost Data 1974, Robert S. Means Company, Duxbury, Massachusetts, 1974.

C. Mass Transit Design Change Costs

Mass transit design change costs, like roadway design change costs, can vary widely. Exhibit F-9 shows the costs of rail transit systems in relation to the year of construction. The high points in the exhibit reflect systems requiring new right-of-way acquisition and construction and, particularly in the case of New York City, having unusual construction difficulties as well as four tracks on part of the route. Two of the five lowest points represent extensions within freeway medians (Eisenhower and Dan Ryan in Chicago); three indicate upgradings of existing rail lines. The differences evident in the exhibit are typical of the variation possible in all types of transit systems.

Transit vehicle costs have increased sharply in recent years. Exhibit F-10 shows that there has been a 6.43 percent average annual increase in rail car costs from 1950 to 1972. Since this increase is partially attributable to increased car quality, future rates of increase may be somewhat lower due to slower increases in car quality and the enlargement and stabilization of the rail transit car market. However, these factors could be offset by recent large increases in material costs (e.g., steel and aluminum).

Bus costs increased 20 to 24 percent from 1971 to 1973.[1] At present bus manufacturing is near capacity with an 18-month backlog on orders. Delivery time on new orders is approximately 29 months from the time bids are solicited.[2] Shortages are apparent in the supply of parts and accessories, particularly engines, transmissions, sheet metal, wheels, windows, and window fasteners. Nevertheless, there is some sign that the situation will ease as General Motors Corporation is expected to increase its production by more than 40 percent (from 30 to 50 units per week).

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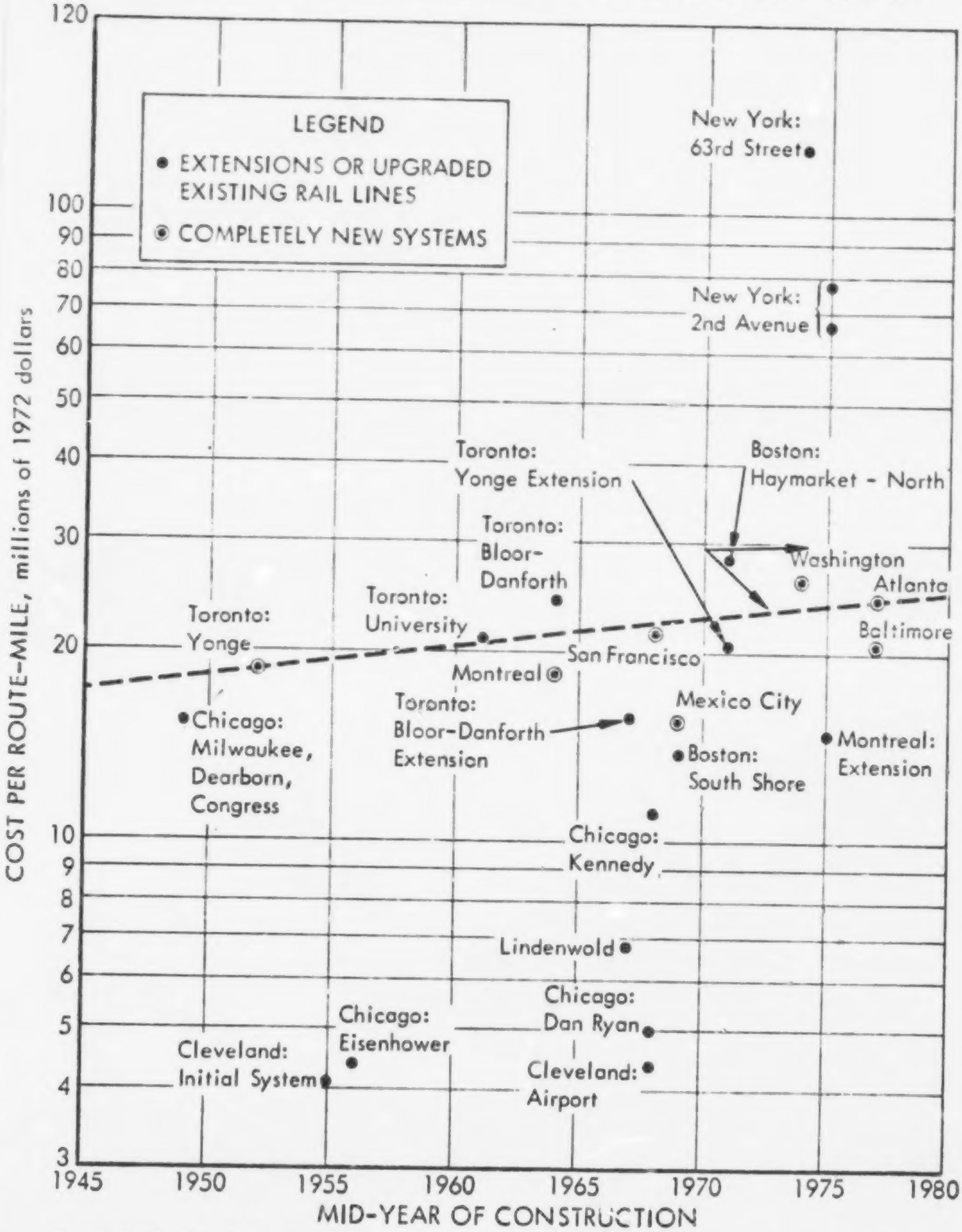
[1] Dave Sylvia, Cleveland Transit System, May 1974.

[2] National Journal Reports, Vol. VI, No. 4 (26 January 1974), p. 121.

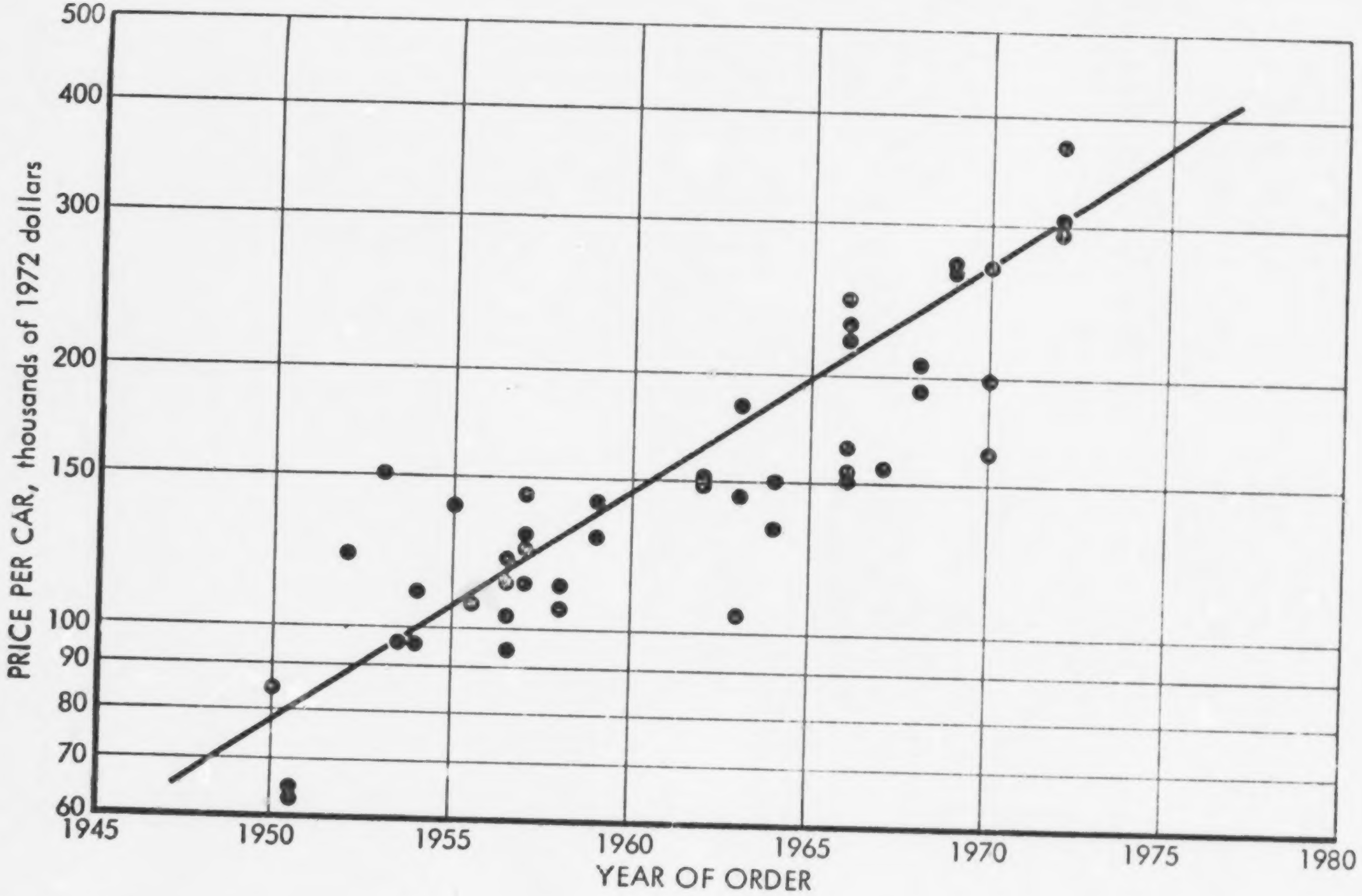
Exhibit F-11 presents an overview of mass transit capital investment costs. However, these costs tell only part of the story as annual operating costs can also have a significant impact on the actual cost of a system. Exhibits F-12 through F-15 itemize the operating costs for rail rapid transit, buses, minibus and bus-wagon, and taxis for dial-a-ride systems. Exhibit F-16 shows typical bus chartering costs. Exhibit F-17 indicates the operating costs for personal transit and guideway systems.

EXHIBIT F-9
RAIL TRANSIT SYSTEM COSTS VS. MID-YEAR OF CONSTRUCTION



Source: J. Hayden Boyd, Norman J. Ascher, and Elliot S. Wetzler, Institute of Defense Analysis, Program Analysis Division, Evaluation of Rail Rapid Transit and Express Bus Service in the Urban Commuter Market, prepared for the U.S. Department of Transportation, October 1973, p. 37.

EXHIBIT F-10
RAIL TRANSIT CAR PRICES VS. YEAR OF ORDER



Source: Boyd, Ascher, and Wetzler, p. 36.

EXHIBIT F-11
MASS TRANSIT CAPITAL INVESTMENT COSTS

Rapid Rail (1974 $)[1]	
Elevated system:	$15 million per dual-lane mile
At-grade system:	$8 million per dual-lane mile
Subway system:	$30 million per dual-lane mile
Subway car:	$300,000 per vehicle
Subway station:	$1 million to $4 million
Buses (1974 $)	
Conventional 40-seat bus:	$50,000 to $52,000[2]
Conventional school bus converted for transit use:	$10,000[3]
Luxury, express, 57-seat bus:	$50,000 to $70,000[4]
Minibus:	$16,800 to $30,000[5]
Taxicab for dial-a-ride:	$3,000 (1972 $)[6]
Busway	
Low-cost implementation using cones as dividers	$30,000 (1973 $)[7]
Project requiring new land and construction--composite cost for both elevated and at-grade:	$4 million per dual-route mile (1974 $)

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[1] N. John Beck, Vice President, Transportation Systems, Rohr Industries, Inc., testimony before the Subcommittee on Transportation Appropriations, Committee on Appropriation, U. S. House of Representatives, 5 March 1974.

[2] Telephone interview with Dave Sylvia, Cleveland Transit System, May 1974.

[3] "Blue Bird Brand" Catalogue, 16 April 1974.

[4] Dave Sylvia, May 1974.

[5] *Ibid.*

[6] Boyd, Ascher, and Wetzler, *op. cit.*, p. 27.

[7] The City of New York, Department of Transportation.

EXHIBIT F-11 (Cont'd)

Personal Rapid Transit	
Elevated guideway:	$6 million per dual-lane mile (1974 $)[8]
Vehicle for subway/aerial dual-mode guideway:	$5,000 per vehicle (1968 $)[9]
People Mover Systems	
Four recent airport people mover systems:[10]	$2.5 million to $32 million (in construction year)
Costs broken down for one system (1968 $):[11]	
• Excavating and lining underground passage:	$5.4 million per mile
• Equipment, including 24 escalators and 2.3 miles of low-speed pedestrian belts:	$15.6 million
Horizontallators (1970 $):[12]	
• Stations:	$190,000 to $380,000
• Excavation of tunnels:	$8 million per mile
• Guideway rails in place:	$100,000

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[8] N. John Beck, *op. cit.*, p. 15.

[9] D. M. B. Baumann and D. G. Wilson, eds., *Urban Engineering and Transportation*, American Society of Mechanical Engineers, New York, December 1968, p. 52.

[10] Hal Puckett and James C. Williamson, "Houston Airport's Low Cost People-Mover," *Transportation Engineering Journal*, February 1974, p. 262.

[11] Baumann and Wilson, *op. cit.*, pp. 50-51.

[12] Urban Design and Development Corporation, *A Study of Internal Circulation Systems for the Post Oak Urban Center*, Houston, Texas, 1 Mar. 1970.

EXHIBIT F-11 (Cont'd)

• Elevated guideway --	
open:	$1.4 million per mile
enclosed:	$1.7 million per mile
• Power system source and distribution:	$170,000 per mile
• Control system:	$130,000 plus $68,000 per mile
• Vehicles:	$770 to $1,500

EXHIBIT F-12
RAIL RAPID TRANSIT OPERATING COSTS[a], BY CATEGORY
(Average Values, U.S. Properties Only)

Category Number	Category Name	Costs per Passenger Car-Mile					
		Current Dollars		Annual Growth Rate (%)	Constant 1972 Dollars		
		1960	1970		1972	1980	1990
4	Way and Structures	.128	.228	3.12	.261	.334	.454
5	Equipment	.074	.154	4.74	.182	.264	.419
6	Power-Maintenance	.012	.022	3.20	.025	.032	.045
7	Power (Purchased-Generated)	.086	.110	-0.28	.118	.115	.112
8	Conducting Transportation	.420	.772	3.42	.890	1.164	1.630
9	Wages of Trainmen	.143	.238	2.42	.269	.326	.414
10	General Miscellaneous	.151	.370	6.45	.452	.745	1.392
11	Injuries and Damages	.035	.092	7.17	.114	.198	.396
12	Traffic	.001	.003	11.61	.004	.010	.029
14	Operating Taxes	.073	.082	-1.55	.086	.076	.065
15-13	TOTAL OPERATING EXPENSES	.92[b]	1.57[b]	2.66	1.78[b]	2.20[b]	2.86[b]

a. Excludes depreciation and amortization chargeable to operations.
b. Elements do not add to total because all properties did not report every item and because of change in relative weights over time.

Source: Boyd, Ascher, and Wetzler, p. 34

EXHIBIT F-13
BUS OPERATING COSTS[a], BY CATEGORY

Category Number	Category Name	Costs Per Vehicle Mile					
		Current Dollars		Annual Growth Rate (%)	Constant 1972 Dollars		
		1960	1970		1972	1980	1990
4	Equipment, Maintenance, and Garage	.102	.140	.46	.152	.159	.165
7	Transportation[b]	.269	.404	1.37	.447	.499	.571
3	Drivers', Helpers' Wages, etc.	.216	.335	1.69	.373	.427	.505
9-12	Fuel and Oil	.027	.028	-2.32	.029	.024	.019
13	Station	.001	.001	-2.67	.001	.001	.001
14	Traffic, Advertising, etc.	.004	.005	-.48	.005	.005	.005
15	Insurance and Safety	.023	.033	.91	.036	.039	.043
17	Administrative and General	.055	.088	2.01	.099	.116	.141
20	Operating Taxes and Licenses	.047	.054	-1.31	.057	.051	.045
21	Operating Rents - Net	.004	.007	2.93	.008	.010	.013
	TOTAL OPERATING COST	.504	.732	1.03	.805	.874[c]	.988[c]

a. Excludes depreciation and amortization chargeable to operations.
b. Transportation includes other items in addition to the two listed here.
c. Elements do not add to total because of change in relative weights over time.

Source: Averages for 38 bus properties for 1960 and 1970 from IDA Computerized Data Bank on Urban Transportation.

Source: Boyd, Ascher, and Wetzler, p. 25.

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EXHIBIT F-14
MINIBUS AND BUS-WAGON OPERATING COSTS

Costs	Annual Growth Rate (%)	Cost per Vehicle-Mile		
		1972	1980	1990
19-PASSENGER MINIBUS				
Operating Costs		.639	.699	.780
Vehicle	1.2	.635	.694	.774
Road O&M	1.73	.004	.005	.006
8-Passenger BUS-WAGON				
Operating Costs		.304	.341	.396
Vehicle	1.5	.303	.340	.395
Road O&M	1.73	.001	.001	.001

Source: Boyd, Ascher, and Wetzler, p. 33

EXHIBIT F-15
TAXI OPERATING COSTS

Category Name	Assumed Growth Rate (%)	Dollars per Vehicle Mile			
		1970 (Current Dollars)	Constant 1972 Dollars		
			1972	1980	1990
Driver Cost	1.69	.156	.174	.199	.235
Vehicle Operation	None	.025	.027	.027	.027
Tires		.003			
Gasoline		.022			
Maintenance	.46	.020	.022	.023	.024
Labor		.011			
Parts		.009			
Public Liability Insurance	.91	.016	.018	.019	.021
Other (General and Administrative, Garage)	2.01	.049	.055	.065	.080
TOTAL		.266	.296	.333	.387

Source: Wells, John D., *et al*, Economic Characteristics of the Urban Public Transportation Industry, Institute for Defense Analyses for U.S. Department of Transportation, February 1972.

Source: Boyd, Ascher, and Wetzler, p. 26.

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EXHIBIT F-16
BUS CHARTERING COSTS

Costs obtained for 12-hour service on 24 trips in a four-mile vicinity. Costs include bus, driver, mileage, insurance, and maintenance.

45-passenger bus	$ 154
24-passenger bus	$ 168
9-passenger minibus	$ 96

Source: Harbridge House, Inc., survey of major bus lines in Cleveland, Oakland, Pittsburgh, and Boston.

EXHIBIT F-17
PERSONAL TRANSIT AND GUIDEWAY SYSTEM OPERATING COSTS

Above-ground personal transit system:	$173,000 per mile and $194 per vehicle
Subway/aerial personal transit guideway:	$264,000 per mile and $377 per vehicle
Subway/aerial dual-mode guideway:	$228,000 per mile and $377 per vehicle

Source: Baumann and Wilson, *op. cit.*, p. 52.